

Table No. 2. Macroscopic characters with taxonomic value in the
genus *Psilocybe*

Pileus

form
size (diameter)
color
surface (even or striate; glabrous or scaly)
dry or viscid

Lamellae

position
color
edges (even or floccose; color)

Stipe

size
surface (smooth, scaly, floccose, fibrillous)
presence of rhizomorphs
presence of pseudorhiza
presence of annulus

Context

color
consistence
bluing
odor and taste

Chemical reactions

(on the basidiocarps with KOH at 5%)

The Genus *Psilocybe*

A systematic revision of the known species
including the history, distribution and
chemistry of the hallucinogenic species

with 781 figures on 76 plates

by

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To the memory of
my son

Gastón Guzmán Dávalos

1963-1978

this book is dedicated

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Preface

Since the Mexican hallucinogenic fungi were brought to the attention, first through the Schultes' (1939, 1940), Reko's (1945) and Singer's (1949) works, and subsequently through the Wasson & Wasson's (1957), Heim & Wasson's (1958), and Singer & Smith's (1958) researches, widespread interest in these mushrooms has developed and numerous studies of them have been made.

However, no taxonomic works in the genus *Psilocybe* were available. Kühner & Romagnesi's book (1953) only recognized 13 species (as *Geophila*), but Singer in *Agaricales in modern taxonomy* (1975) considered 84 species of which only 48 are here recognized. Singer & Smith's monograph (1958) only studied the Section *Caerulescentes* Sing. of *Psilocybe*, and they described 18 species. But Guzmán & Vergeer (1958) presented a list of the 390 taxa known in the genus, of which 210 were excluded. Then it is clear that *Psilocybe* is a large and complex genus and a monograph is necessary to understand the systematic of the species. One of the first problems to be dealt with in the taxonomic of the genus was to exclude species now recognized as belonging in other genera, especially *Psathyrella*, *Naematoloma*, *Agrocybe*, *Stropharia*, *Panaeolus*, *Melanotus* and *Pholiota*.

In the present monograph, special effort has been to deal with all the described species through the study of the types. This monograph follows the standard pattern of taxonomic treatments of the Agaricales, and represents more than ten years of study. The author began this research when he learned that to understand the Mexican species he needed learn the *Psilocybe* flora of North America, and to accomplish the latter it was necessary to know the *Psilocybe* flora of Europe. But it was surprise to see that no modern comprehensive account of the North American species was available, and likewise, none was available for the European *Psilocybe* flora. On the other hand, there are many large regions of the world on which no critical collecting of *Psilocybe* has been done.

The present contribution is a further study of the genus *Psilocybe* throughout the world. 467 species were considered, of which 144 are recognized as valid and are treated in detail, of which 52 species were described by the author. 90 names are placed in synonymy, 119 are of doubtful status, and 114 are excluded.

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This monograph was possible thanks to the help of many friends and colleagues. First of all I wish to express my deep gratitude to Dr. A. H. Smith and Dr. R. Singer who helped me with guidance and criticism. I am much indebted to them for the generosity with which they put their herbaria, private notes, and photographs at my disposal.

Prof. R. Heim kindly gave important collections of *Psilocybe* to the author for deposit in the ENCB Herbarium, including the types of all the Mexican species described by him. My thanks are also extended to the Director of ENCB Herbarium and the authorities of the Instituto Politécnico Nacional at Mexico City, for their assistance in my work. The financial support for part of this monograph including trips in 1972 to several Herbaria of U.S.A., South America, Europe, and Japan, was received from the Guggenheim Memorial Foundation at New York. COFAA of the Instituto Politécnico Nacional provided a grant to the author for research studies.

CONACYT at Mexico City supported part of the research on the tropical and sub-tropical Mexican species during 1976-1980. The funding for the final re-copy of the manuscript of this book and for the preparation of the illustrations and expenses for xerocopies and send them to the reviews has been provided by CONACYT, as well the pay of the color plates.

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Table No. 1. Herbaria of the world where the *Psilocybe* specimens discussed in this monograph are deposited

AD	State Herbarium of South Australia, Adelaide, AUSTRALIA
DDW	Waite Agriculture Research Institute, Adelaide, AUSTRALIA
BAFC	Facultad de Ciencias Exactas y Naturales, Universidad de Buenos Aires, ARGENTINA
BP	Museum of Natural History, Department of Botany, Budapest, HUNGARY
BPI	National Fungus Collections, U.S. Department of Agriculture, Beltsville, U.S.A.
BRA	Slovenské národné múzeum, Bratislava, CZECHOSLOVAKIA
C	Botanical Museum, University of Copenhagen, DENMARK
CUP	Plant Pathology Herbarium, Cornell University, Ithaca, N.Y., U.S.A.
E	Royal Botanical Gardens, Edinburgh, GREAT BRITAIN
ENCB	Escuela Nacional de Ciencias Biológicas, Instituto Politécnico Nacional, Mexico City, MEXICO

F	Field Museum of Natural History, Chicago, U.S.A.
FLAS	University of Florida, Department of Botany, Gainesville, Florida, U.S.A.
GB	Botanical Museum, Göteborgs Universitet, Göteborgs SWEDEN
H	Botanical Museum, University of Helsinki, FINLAND
IB	Institut für Mikrobiologie, Universität Innsbruck, AUSTRIA
INPA	Instituto Nacional de Pesquisas de Amazonia, BRAZIL
K	Royal Botanic Gardens, Kew, Surrey, ENGLAND
L	Rijksherbarium, Leiden, HOLLAND
LIL	Instituto Miguel Lillo, Tucuman, ARGENTINA
LFG	Laboratoire Forestier de l'Etat, Faculté de Sciences Agronomiques, Gembloux, BELGIUM
LD	Universitets Botaniska Museum, Lund, SWEDEN
LG	Université de Liège, Département de Botanique, BELGIUM
LPS	Instituto de Botánica Spegazzini, La Plata, ARGENTINA
LY	Herbiers de l'Université de Lyon, Département de Biologie Végétale, Villeurbanne, FRANCE
MEXU	Herbario Nacional, Instituto de Biología, Universidad Nacional Autónoma de México, Mexico City, MEXICO
MICH	University of Michigan Herbarium, Ann Arbor, Michigan, U.S.A.
NY	New York Botanical Garden, New York, U.S.A.
NYS	University of the New York State Herbarium, Albany, U.S.A.
O	Botanical Museum, University of Oslo, NORWAY
ORE	University of Oregon Herbarium, Eugene, U.S.A.
PACA	Herbario Anchieta, Sao Leopoldo, BRAZIL
PC	Museum National d'Histoire Naturelle, Laboratoire de Cryptogamie, Paris, FRANCE
PRM	Mycological Department, National Museum, Praha, CZECHOSLOVAKIA
QUE	Herbarium du Québec, Ministère de l'Agriculture, Québec, CANADA
S	Swedish Museum of Natural History, Stockholm, SWEDEN
SAPA	Botanical Institute, Faculty of Agriculture, Hokkaido University, Sapporo, JAPAN
SFSU	San Francisco State University Herbarium, Department of Biology, San Francisco, California, U.S.A.
SGO	Museo Nacional de Historia Natural, Santiago, CHILE
SP	Instituto de Botânica, Sao Paulo, BRAZIL
TNS	National Science Museum, Department of Botany, Tokyo, JAPAN
UNL	Facultad de Ciencias Biológicas, Universidad Autónoma de Nuevo León, Monterrey, MEXICO
USCG	Excuela de Biología, Universidad de San Carlos, Guatemala, GUATEMALA
UPS	Institute of Systematic Botany, University of Uppsala, SWEDEN
W	Naturhistorisches Museum, Wien, AUSTRIA
WTU	Department of Botany, University of Washington, Seattle, U.S.A.
ZT	Institut für Spezielle Botanik, Zürich, SWITZERLAND

INTRODUCTION

1. Materials and Methods

This monograph is based mainly on a study of all available types of described species of *Psilocybe*, along with studies of many collections from various regions deposited in the world's major herbaria. The author visited the herbaria BAFC, BPI, GB, K, L, LIL, LPS, MEXU, MICH, NY, PC, PRM, SAPA, SFSU, SP, TNS, UNL, and WIU. In addition, many specimens were sent to him at his laboratory (ENCB) for critical study (see table 1).

Extensive explorations looking for *Psilocybe* species were made in Mexico for several years (1956-1980), through different ecological and geographical regions, such as coniferous forests, subalpine zones, subtropical regions and tropical rain forests. Also short and long field trips were made in northwestern U.S.A. and Canada (1976), in southeastern U.S.A. (1971), Venezuela, Brazil, Uruguay and Argentina (1971), Colombia (1965 and 1971), Switzerland (1971), Japan (1971), and Peru (1976).

The studied collections in this monograph came from all the continents, but Africa and northern Asia, however, are poorly represented. There are few collections of *Psilocybe* from these regions in the most important herbaria of Europe. The Herbaria from which material, documents and other information were received are indicated in the text following the abbreviations in *Index Herbariorum* of 1974. These herbaria are shown in table 1. Unfortunately, however, some important collections at Kew Herbarium were not studied by the author (except a few kindly provided for Dr. D.M. Dring during his short stay at Kew in 1971), because this herbarium does not send agarics across the sea.

Besides the 46 herbaria mentioned in the table 1, important collections were studied from the following herbaria not included in *Index Herbariorum*:

Herbarium of Bon at France
Herbarium of Hongo at Japan
Herbarium Tottori Mycol. Inst. at Japan
Herbarium of P. Vergeer at San Francisco, U.S.A.
Herbarium of the University of Veracruz at Xalapa (Mexico)
Herbarium of the University of Morelos (Mexico)

As is common with herbarium materials, several collections studied were incomplete particularly with regards notes on color, odor and taste. Spore prints were often lacking also. Observations on microscopic features were made using small fragments of the gill, pileus or context obtained by free-hand sectioning and mounted in a 5% KOH solution. In some cases Melzer's reagent, 10% solution of NH_4OH or Cotton-Blue in lactophenol, were made. A number of collections from Mexico, North America and South America, were studied in the fresh condition. With the substantial assistance of C. Bas. E. Horak, R. Singer, A.H. Smith and R. Watling, however, it was possible to study an important number of collections from Europe, U.S.A., South America and Australasia with accompanying excellent descriptions drawn from fresh material by these investigators.

2. Discussion of characters used in delimiting species

There is no rule to distinguish species following some set of macroscopic or microscopic characters. At first mycologists considered only the macroscopic features but after the beginnings of microscopic study in mycology, the spores, and then the cystidia were used to delimit species in *Psilocybe*.

Nowadays the following macroscopic features in Agaricales are taken into account: 1) form, size and color of the pileus, 2) surface of the pileus, if it is dry or viscid, 3) even or striate, 4) glabrous or scaly, 5) position of the gills, 6) color of the gills, 7) if these are close or distant, 8) development of the veil, 9) presence or absence of annulus, 10) size, color and surface of the stipe, 11) if it is solid, stuffed or hollow, 12) presence of rhizomorphs and pseudorhiza, 13) color and consistency of the context,

Table No. 2. Macroscopic characters with taxonomic value in the genus *Psilocybe*

Pileus	form
	size (diameter)
	color
	surface (even or striate; glabrous or scaly)
	dry or viscid
Lamellae	position
	color
	edges (even or floccose; color)
Stipe	size
	surface (smooth, scaly, floccose, fibrillous)
	presence of rhizomorphs
	presence of pseudorhiza
	presence of annulus
Context	color
	consistence
	bluing
	odor and taste
Chemical reactions	(on the basidiocarps with KOH at 5%)

14) change of the color when bruised or cut, 15) odor and taste, and 16) color of the spore print. The most commonly used microscopic characters are: 1) size, form and color of the spores, 2) thickness of the wall, 3) form, size and number of sterigmata of the basidia, 4) color, size and form of the pleurocystidia and cheilocystidia, 5) thickness of the walls of the pleurocystidia and cheilocystidia, 6) presence of drops of crystal inclusions at the apex, 7) structure of the subhymenium, 8) structure of the trama, 9) structure of the hypodermium, 10) structure of the epicutis and 11) presence of clamp connections.

Table 2 presents an evaluation of the macroscopic characters of the genus *Psilocybe* that are of taxonomic value, and table 3 an evaluation of the microscopic characters. To divide the genus in sections the following characters were used: 1) presence or absence of pleurocystidia, 2) color of the pleurocystidia, 3) form and size of the spores, 4) thickness of the spore wall, 5) presence or absence of an annulus, and 6) bluing reaction.

To delimit species the following characters are the more important (besides the mentioned above): 1) form of the pileus, 2) surface viscid or dry (of the pileus), 3) position of the gills, and 4) structure of the subhymenium and hypodermium.

The form of the pileus is of taxonomic value in *Psilocybe*. *P. semilanceata* is distinguished from *P. callosa* on the papilla in the first and in the convex to $\pm$ subumbonate pileus in the latter. *P. mexicana* has habit mycenoid, but *P. caerulescens* has habit collybioid. But some species, such as *P. zapotecorum* present a strong variation in the form of the pileus, from convex to subumbonate, or even papillate. The size of the pileus, mainly the diameter, varies greatly. There are however groups of species with characteristically small pilei, e.g. the Sections *Psilocybe*, *Brunneocystidiatae*, *Cordisporae*, *Mexicanae*, *Pratensae* and *Singerianae*, that have pilei 5-20 mm in diameter, except in a few cases such as *P. caerulescens* var. *caerulescens* of the Section *Cordisporae* which has a pileus (10-) 30-70 (-100) mm in diam., but (5-) 15-40 (-50) mm in the var. *ombrophila*. On the other hand, species of the Sections *Cubensae* and *Squamosae*, have quite large pilei, more than 20 mm in diameter. Some species of different Sections are distinguished by the small pileus, as *P. tasmaniana* (Section *Cyanescens* with large pileus). *P. cubensis* and *P. zapotecorum*, seem to have the largest pilei in the genus, up to 85 mm in diameter the first and up to 110 mm in second.

The color of the pileus in all the species of *Psilocybe* is in various tones of brown. In some species there are some important color differences. In *P. squamosa* the pileus is brownish yellowish, but its variety *thrausta* has the pileus reddish brown orange. All the species of the Section *Aztecum* are easy to distinguish by their whitish or almost white pileus when dry.

The gelatinous pellicle is taxonomically important in several species. *P. pelliculosa*, *P. semilanceata*, *P. subfimetaria*, *P. fimetaria*, *P. liniformans*, *P. baecystis*, *P. muscorum*, *P. subviscida* and others, have a removable gelatinous pellicle, but several other species as *P. xeroderma* have pilei dry or as merely moist or lubricous. Microscopically it is possible to find a gelatinous layer in the species with a viscid

determine by microscopic examination whether the pileus was viscid or lubricous. This is the reason to consider *P. aerugineomaculans* (Höhnelt) Sing. & Smith as synonymous with *P. subaeruginascens* Höhnelt. Singer & Smith (1958b) separated both species because of the gelatinized epicuticular layer of the pileus in the former and for its absence in the latter. However, microscopic examination of the type of *P. subaeruginascens* by the author revealed a subgelatinous layer in the pileus. *P. singerii* Guzmán has a lubricous to dry pileus, but the microscopic study reveals a subgelatinous layer on the pileus.

The position of the lamellae on the stipe is an important feature to separate some species of *Psilocybe*. Those species with fimicolous habitat and subhexagonal spores such as *P. merdaria*, *P. argentina* and *P. coprophila* frequently have broadly adnate gills. But those species of the Sections *Psilocybe*, *Cordispora* and *Semilanceatae* and others have adnexed or adnate or even subdecurrent, or somewhat sinuate gills. The gills are never decurrent in *Psilocybe*, nor are they free (but note well the gills often separate from the stipe like free gills in dry specimens).

The color of the gills is pale or dark brown violaceous, but in young specimens somewhat pale brownish, or pale gray; sometimes they are mottled, and the edges frequently are white and fimbriate or floccose.

The form and size of the stipe, generally do not have taxonomic value. Some species have a subbulbous stipe, others a sinuous one. The stipe surface in several species is subfloccose or somewhat scaly, in others it is smooth. Generally the stipe is solid in young stages, then is stuffed with white mycelium, and finally hollow with age. Contrary to the form and size of the stipe, the presence of rhizomorphs has taxonomic value, species such as *P. cyanescens* and *P. aztecorum* (in this latter its both varieties) are distinguished by their conspicuous white rhizomorphs. The presence of pseudorhiza has taxonomic value; in species such as *P. galindii* it can be separated from *P. mexicana* by its long pseudorhiza; *P. fagicola*, *P. anellariiformis*, *P. subanellariiformis* and *P. wassoniorum* are characterized by a well formed pseudorhiza. *P. singeri* and *P. veraecrucis* differ between them by the pseudorhiza.

The veil is generally poorly developed in *Psilocybe*, except in those species in the Sections *Cubensae*, *Merdariae*, *Squamosae* and *Stuntiae* that have a well developed annulus. Another exception is in *P. bullacea* and *P. andina*, both in the Section *Psilocybe* are separated from the others of the section by the presence of annulus.

The color of the context has little taxonomic value. Generally it is white, whitish or brownish, and unchanged when cut or bruised. But several species show a conspicuous bluing reaction. These are found in the old Section *Caerulescentes* Sing., now considered in the new Sections *Brunneocystidiatae*, *Subaeruginosae*, *Cordisporae*, *Mexicanae*, *Stuntiae*, *Cubensae*, *Zapotecorum*, *Aztecorum*, *Cyanescens*, and *Semilanceatae*. The majority of these bluing fungi have a farinaceous taste and odor. The non-bluing species are generally odorless and tasteless or somewhat fungoid.

Spores (see Plate 1)

form
size
thickness of the wall

Pleurocystidia

form
size
color

Cheilocystidia

form
size
color

Structure of the subhymenium and hypodermium (incrusted pigment on the walls;
form of the elements and thickness of the walls)

Degree of hyphal gelatinization of epicutis

Chemical reactions in the genus *Psilocybe* are little known. Few species known to react with 5% KOH solution the pileus and context, turning brownish or deep brownish orange, e.g., in *P. singerii*, and *P. weldenii*. In *P. uxpanapensis* KOH stains the pileus and stipe deep orange brown, but slightly so in the context. The stipe generally is negative or only slightly positive with KOH. In other species, for example, *P. montana*, the KOH solution stains the pileus brownish black. All parts of *P. banderillensis* turn yellowish brown; and the pileus of *P. caerulescens* var. *caerulescens* turns pale brownish red to blackish, the stipe pale brownish, and the context brownish gray or reddish.

The spores (form, size and thickness of the wall) are very important in the taxonomy of *Psilocybe*. It is possible to distinguish subellipsoid, subrhomboid, rhomboid, subhexagonal, and mango form spores (see Plate 1), and thin or thick wall spores (the former not more than 0.5 μ m thick, and the latter 1-1.5 μ m thick). All the species of the Sections *Cordisporae*, *Mexicanae*, *Coprophilae*, *Cubensae*, *Merdariae*, *Semilanceatae* and *Cyanescens* have thick walled spores, but the species of the Sections *Zapotecorum*, *Pratensae*, and *Singerinae* have thin walled spores. In the Section *Psilocybe* is possibly to find such species with thick walled spores as *P. montana*, and species with thin walled spores, such as *P. inquilina*, *P. crobula* and *P. smithiana*. The germ pore is always present.

The basidia have little taxonomic value. They are usually hyaline and subventricose or subcylindric, and sometimes with a slight median constriction. They are 4-spores, but sometimes 2-, or 3-spored basidia are present.

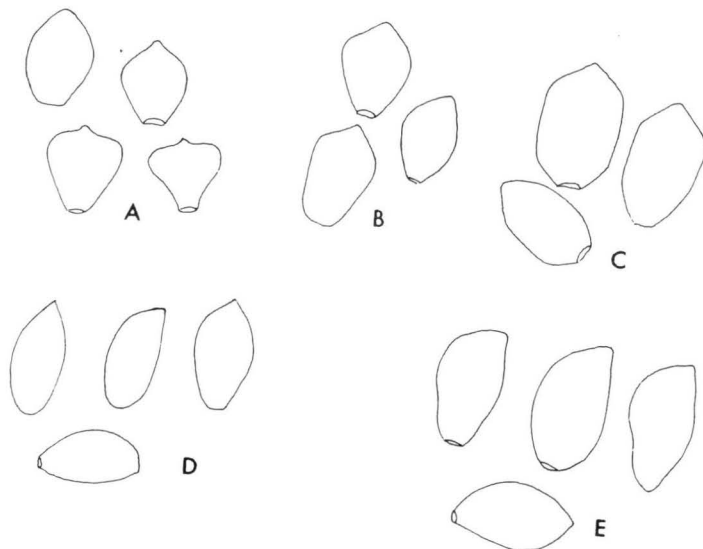


Plate 1: Form of the spores in the species of *Psilocybe*. A: Rhomboid, B: Subrhomboid, C: Subhexagonal, D: Subellipsoid, E: Asymmetrical (mango form) (this latter in *P. baecystis*).

The pleurocystidia have great significance in the taxonomy of *Psilocybe*. First, their presence or absence is important. The Sections *Semilanceatae* and *Cyanescens* are both separated by the absence of pleurocystidia in the former, and their presence in the latter. Pleurocystidia are usually hyaline, but the tropical species, as those of the Section *Brunneocystidiatae* and the Australian species *P. subaeruginosa* Clel. of the Sect. *Subaeruginosae*, the pleurocystidia are brown or brownish. If chrysocystidia are defined as cystidia with yellow homogeneous content or at least with a hyaline refringent central mass, the chrysocystidia are absent in the genus *Psilocybe*. The fungi *P. aequatoria*, *P. alnetorum*, *P. cokeriana* and *P. neocaledonica* are now considered in the genus *Naematoloma* (see excluded species, and Guzmán, 1980), because they have chrysocystidia.

Cheilocystidia are usually present but in a few not well known species, such as *P. lonchophorus* and *P. ochreata* the cheilocystidia have not been seen. Their form and size are of great value in the taxonomy of the genus. In few species they are brown or brownish (as those of Sect. *Brunneocystidiata*), but generally they are hyaline. The lageniform cheilocystidia are the most common, but in some species as *P. yungensis* the cheilocystidia are variable in form, from ventricose or clavate to obclavate or ventricose-rostrate.

The structure of the subhymenium seems to be of importance. Unfortunately, in several species, little is known about the subhymenium. In many species of Section *Psilocybe* such as *P. montana* and related species, the subhymenium is subcellular, and the thick walled hyphae are strongly incrustated with brownish orange or yellowish pigment. The same is true in several species of the Section *Cordisporae*. In other species, such as those of the Section *Semilanceatae*, the subhymenium is neither cellular nor incrustated on the walls with pigment, at least not so conspicuously as in other sections.

It has been generally accepted that *Psilocybe* does not have a cellular or subcellular hypodermium, which differentiates it from *Naematoloma* with subcellular hypodermium (Singer, 1975). However, there are several species in different sections, e.g. *P. phyllogena*, *P. hoogshagenii*, *P. coprophila*, *P. squamosa*, *P. atrobrunnea*, *P. uxpanapensis*, *P. subaeruginosa* and others, whose hypodermium is formed with subglobose cells similar to those in *Naematoloma*. Then the only strong character separating *Psilocybe* and *Naematoloma* is the absence of the chrysocystidia, in the former and the presence in the latter, as Guzmán (1980) discussed.

3. Ecology and distribution of the species

All the species of *Psilocybe* are saprophytic and none are known to be parasitic or symbiotic. The substrata on which they grow are very diverse, as shown in table 4. They occur on soil, rotten wood, herbaceous stems, humus, mosses, dung and diverse refuse materials.

There are few studies in the ecology of the species of this genus. Darimont (1973) made some interesting observations in the forests of Belgium (*Quercus-Carpinus* forests), on the ecology of *P. montana*, *P. crobula*, *P. inquilina* and *P. semilanceata*. Lange (1948, 1978) and Lange & Lisiewska (1969) observed on the frequency of some species in the deciduous forests of Denmark. Lange (1955 & 1957) also reported on some species in Greenland.

Referring to the ecology and distribution of the species of *Psilocybe* in Mexico, the author (1958; 1959a; 1960) made some observations on the Mexican hallucinogenic species. He reported the habitat of *P. muliercula* (Figs. 668-669 & 708), known at that time only from a popular market of Tenango del Valle, State of Mexico, where it was described by Heim (1958) (as *P. wassonii* Heim) and Singer & Smith (1958a,b). The habitat of this species is on muddy or swamp soil on the walls of ravines without herbaceous plants, in an *Abies religiosa* H.B.K. forest at 3150-3500 m elevation. Later (Guzmán, 1970) *P. muliercula* was not only found in the same kind of swamp soils, and ravines, but also in an open *Pinus* forest, at 2600-2800 m elevation.

The kind of soils where the species of *Psilocybe* grow can be humus, clay or sandy soil. The color of these soils can be black, grayish, brown, orangish brown, or orangish red. *P. caerulea* var. *caerulea* (Figs. 660-661), *P. cordispora* and *P. heimii* are common in clay brown, orangish brown, or orangish red soils. But *P. uxpanapensis*, *P. singeri*, *P. weldenii*, *P. semilanceata*, *P. pelliculosa* and others are common in sandy or clay black or grayish soils. *P. caerulea* var. *ombrophila* (Figs. 715-716), and sometimes *P. zapotecorum* are common in humus.

Species mainly growing in muddy soil or swampy soil without herbaceous plants are *P. hoogshagenii* var. *hoogshagenii*, *P. zapotecorum* (Figs. 751 & 754), and *P. muliercula*; but *P. heimii* and *P. caeruleoannulata* occasionally grow in this habitat. All these fungi, except *P. muliercula*, are from deciduous or subtropical forests; *P. muliercula* grows only in *Abies* and *Pinus* forests. *P. hoogshagenii* var. *hoogshagenii*, a species very common in Mexico, was found (Guzmán, 1978a) in the same swampy habitat in Argentina, close to Buenos Aires (Delta del Río Paraná), in a subtropical forest where *Oudemansiella canari* (Jung.) Höhnelt (a typical tropical agaric) also grows.

Species that grow on sandy soil are not numerous in *Psilocybe*. Only *P. herrerae*, *P. pratensis* and *P. sabulosa* are known from this habitat. Lignicolous species, or those that grow on rotten wood, sometimes grow also as subnigricolous, even on wood debris in soil, on twigs in the soil, or on sawdust. *P. aztecorum* as an example, was first described growing on soil (Heim & Wasson, 1958) but is found more frequently

Table No. 4: Diversity of the substratum in some species of *Psilocybe*

species	1	2	3	4	5	6	7	8	9	10	11	12
<i>P. andina</i>										x		
<i>P. angustispora</i>								x				
<i>P. argentina</i>								x				
<i>P. atrobrunnea</i>											x	
<i>P. australiana</i>					x	x						
<i>P. aztecorum</i> var. <i>aztecorum</i>	x		x	x								
<i>P. aztecorum</i> var. <i>bonetii</i>					x	x						
<i>P. baeocystis</i>			x	x								
<i>P. brasiliensis</i>	x											
<i>P. borealis</i>						x						
<i>P. brunneocystidiata</i>			x									
<i>P. bullacea</i>									x	x		x
<i>P. callosa</i>		x								x		
<i>P. caeruleoannulata</i>		x	x				x	x				
<i>P. caerulea</i> var. <i>caerulea</i>		x							x			
<i>P. caerulea</i> var. <i>ombrophila</i>		x					x					
<i>P. caerulipes</i>			x				x					
<i>P. castanella</i> var. <i>castanella</i>	x											
<i>P. columbiana</i>	x											
<i>P. coprophila</i>									x			
<i>P. cordispora</i>		x						x				
<i>P. crobula</i>			x	x	x				x			
<i>P. cubensis</i>									x	x		
<i>P. cyaneascens</i>					x		x					
<i>P. cyanofibrillosa</i>					x							
<i>P. eucalypta</i>		x			x							
<i>P. fagicola</i> var. <i>fagicola</i>							x					
<i>P. fagicola</i> var. <i>mesocystidiata</i>							x					
<i>P. fimetaria</i>									x	x		
<i>P. fimicola</i>										x		
<i>P. galindii</i>		x										
<i>P. heimii</i>								x				
<i>P. hoogshagenii</i> var. <i>hoogshagenii</i>	x						x	x				
<i>P. hoogshagenii</i> var. <i>convexa</i>		x									x	
<i>P. inquilina</i>						x	x	x		x		
<i>P. latocystis</i>					x							
<i>P. liniformans</i> var. <i>liniformans</i>										x		

Cont. Table 4

species	1	2	3	4	5	6	7	8	9	10	11	12
<i>P. liniformans</i> var. <i>americana</i>									X			
<i>P. mammillata</i>	X		X			X						
<i>P. merdaria</i>							X	X			X	
<i>P. mexicana</i>	X								X			
<i>P. moellerii</i>							X	X				
<i>P. montana</i>										X		
<i>P. muliercula</i>	X					X	X		X			
<i>P. muscorum</i>										X		
<i>P. paupera</i>											X	
<i>P. pintonii</i>	X											
<i>P. plutonia</i>			X	X								
<i>P. phyllogena</i>	X		X			X				X	X	
<i>P. physaloides</i>			X		X			X	X			
<i>P. pratensis</i>	X	X										
<i>P. pseudobullacea</i>								X	X			X
<i>P. quebecensis</i>			X	X								
<i>P. sabulosa</i>		X										
<i>P. semilanceata</i>	X								X			
<i>P. semistriata</i>										X		
<i>P. serbica</i>			X		X							
<i>P. silvatica</i>	X								X			
<i>P. singeri</i>	X											
<i>P. singeriana</i>						X						
<i>P. squamosa</i> var. <i>squamosa</i>						X						
<i>P. squamosa</i> var. <i>thrausta</i>			X			X						
<i>P. stuntzii</i>	X		X									
<i>P. subaeruginascens</i>	X		X			X		X				
<i>P. subaeruginosa</i>			X			X		X				
<i>P. suboophila</i>								X	X			
<i>P. subcubensis</i>								X	X			
<i>P. subalnatorum</i>						X						
<i>P. subborealis</i>					X							
<i>P. subfimetaria</i>									X			
<i>P. subviscida</i>								X	X			
<i>P. tasmaniana</i>								X	X			
<i>P. turtlensis</i>			X									
<i>P. uruguayensis</i>								X				

Cont. Table 4

species	1	2	3	4	5	6	7	8	9	10	11	12
<i>P. uyanapensis</i>		X										
<i>P. venenata</i>		X		X	X	X			X			
<i>P. wassoniorum</i>							X					
<i>P. weldenii</i>		X										
<i>P. wrightii</i>		X										
1. Clay soil							7. Muddy soil or swamp soil					
2. Sandy soil							8. Dung					
3. Rotten wood							9. Rich soil					
4. Wood debris in the soil (including sawdust)							10. Soil covered by mosses mainly with <i>Polytrichum</i>					
5. Herbaceous stems							11. <i>Sphagnum</i> bogs					
6. Humus							12. Refuse materials (as paper refuse, cane sugar refuse, garbage)					

Table No. 5: Variation of the pH in the substrate of some species of *Psilocybe*

species	4.0	4.5	5.0	5.5	6.0	6.5
<i>P. aztecorum</i> var. <i>aztecorum</i>	X	X	X	X		
<i>P. caeruleascens</i> var. <i>caeruleascens</i>			X	X		
<i>P. caeruleascens</i> var. <i>ambrophila</i>			X	X		
<i>P. cubensis</i>	X	X	X			
<i>P. hoogshagenii</i> var. <i>hoogshagenii</i>	X	X	X	X	X	X
<i>P. mexicana</i>			X	X		
<i>P. muliercula</i>				X		
<i>P. singeri</i>	X	X				
<i>P. yungensis</i>		X	X	X		
<i>P. zapotecorum</i>						

on wood debris on twigs in the soil (Figs. 692-695), or even on pines cones (Guzmán, 1978b). *P. baecystis* and *P. quebecensis* are very common on wood debris in the soil, rarely on rotten stumps.

There are some species that present a wide spectrum as to habitats. Examples are *P. venenata*, *P. physaloides* and *P. phyllogena*, which grow on soil, rich soil, rotten wood, herbaceous stems, or dung. The fimicolous species generally are limited to grow on dung. However some, e.g., *P. merdaria* and *P. pseudobullacea*, also grow on other substrata such as refuse materials; *P. merdaria* is reported from paper refuse and *P. pseudobullacea* on sugar cane. This is very interesting of the ecological

point of view. It was assumed the fimicolous fungi are growing on the nitrogenous material of the dung, but if they also grow on refuse sugar cane or paper refuse, it may mean that they require the cellulose of those substrata (dung, sugar cane, paper) and not only the nitrogenous materials alone. The same observations were made by author in *Panaeolus antillarum* (Fr.) Dennis (= *Anellaria sepulchralis* (Berk.) Sing.) a common tropical fimicolous fungus, collected one time in Mexico on refuse sugar cane.

The species that grow on or with mosses are really terricolous. *P. montana* is the most common moss-inhabiting *Psilocybe*, it is very frequently between *Polytrichum* (Fig. 771), but *Psilocybe muscorum*, *P. andina*, *P. phyllogena*, *P. herrerae*, and occasionally *P. muliercula*, grow on mosses also (Fig. 669). Lange & Skifte (1967) reported *P. montana* from different environments in moss and lichens in coniferous wood, on grassland with scattered *Betula* and *Salix*, on sandy soil near cultivated ground, on a shistose base near snow beds, and in *Dryas*-mats above the timber line. In regard to the species that grow on mosses, there is the case of those that grow in *Sphagnum* bogs, e.g., *P. atrobrunnea* and *P. paupera*, but also occasionally *P. phyllogena*. It is interesting to observe the relationships of *P. atrobrunnea* and *P. paupera* with *Naematoloma elongatum* (Pers. ex Fr.) Karst. which grow also in *Sphagnum* bogs. It seems that all these fungi have more orangish yellow pigment in the context and have longer stipes than others.

Guzmán (1959a) studied the variation of pH in the different kind of substrata where *Psilocybe* grow (see table 5). He found that all the hallucinogenic species grow in acid media. The fimicolous species such as *P. cubensis* grow in pH 6-6.5, but the lignicolous species, such as *P. yungensis* grow in pH 4-4.5. The species on the soil, such as *P. caerulescens*, *P. zapotecorum*, *P. muliercula*, *P. hoogshagenii* grow in pH 4-5.5. It is interesting to see that *P. mexicana* a species with a wide distribution grows in pH 4-6.5. Guzmán found in that study that only *Panaeolus sphinctrinus* and *P. antillarum* (= *Anellaria sepulchralis*) grew at pH 5.5-8. Darimont (1973) reported pH of 7-7.3 and 5.2-5.8, respectively, in *Querceto-Carpinetum* and *Quercetum sessiliferae* forests, where *P. crobula*, *P. inquilina* and *P. montana* were collected.

There are species of *Psilocybe* that grow in forests in meadows, and exclusively in gardens, as shown in the table 7. The species from the meadows (Fig. 706), are prati-colous and are found in rich soil, dung or even on herbaceous stems (Figs. 733). In temperate climes, the common meadow inhabiting species are *P. crobula*, *P. inquilina*, *P. bullacea*, *P. coprophila*, *P. merdaria*, *P. moellerii*, *P. pratensis*, *P. callosa*, *P. semilanceata* (Fig. 781), *P. fimetaria*, *P. subfimetaria* and *P. liniformans* (both varieties). From subtropical meadows (Figs. 706-707) the common species are: *P. mexicana*, *P. hoogshagenii* var. *convexa*, *P. galindii*, *P. wrightii* (Fig. 704), *P. cubensis* and *P. subcubensis*; and very occasionally *P. caerulescens* var. *caerulescens*. In open *Araucaria* forests is found *P. brasiliensis* (Fig. 757). Species common in high mountains meadows are *P. fimicola*, *P. andina*, *P. argentina* (Fig. 685), and *P. aztecorum* var. *aztecorum* (Fig. 703). Other species from the high mountains, but on soil without herbaceous plants, are *P. pintonii* and *P. columbina* (only known in the paramos of Colombia).

Table No. 6: Distribution of some species of *Psilocybe* in relationship to the type of vegetation (including open places or meadows)

species	Tropical rain forests	Subtropical and deciduous forests	Coniferous forests
<i>P. argentina</i>		X	X
<i>P. aztecorum</i> var. <i>aztecorum</i>			X
<i>P. aztecorum</i> var. <i>bonetii</i>			X
<i>P. brunneocystidiata</i>	X		
<i>P. caerulescens</i> var. <i>caerulescens</i>		X	
<i>P. caerulescens</i> var. <i>ombrophila</i>		X	
<i>P. caerulipes</i>		X	
<i>P. coprophila</i>	X	X	
<i>P. cordispora</i>		X	
<i>F. fagicola</i> var. <i>fagicola</i>		X	
<i>P. heimii</i>		X	
<i>P. hoogshagenii</i> var. <i>hoogshagenii</i>		X	
<i>P. mamillata</i>		X	
<i>P. mexicana</i>	(X)	X	
<i>P. montana</i>		X	X
<i>P. muliercula</i>			X
<i>P. paupera</i>		X	X
<i>P. plutonia</i>	X	X	
<i>P. serbica</i>		X	
<i>P. silvatica</i>		X	X
<i>P. singeri</i>	X		
<i>P. singeriana</i>	X		
<i>P. subaenatorum</i>		X	
<i>P. subcoprophila</i>		X	
<i>P. subborealis</i>		X	
<i>P. tuxtensis</i>	X		
<i>P. uapamensis</i>	X		
<i>P. venenata</i>		X	
<i>P. weldenii</i>	X		
<i>P. wrightii</i>		X	
<i>P. yungensis</i>		X	
<i>P. zapotecorum</i>		X	

Species very common in coniferous forests are *P. pelliculosa* (Plate 2), *P. borealis*, *P. subborealis*, *P. muliercula*, *P. aztecorum* var. *bonetii*, and *P. silvatica*. Common species in deciduous forests are *P. serbica* (Fig. 761), *P. caeruleipes*, *P. venenata* and *P. semistriata*. In subtropical forests common species are *P. banderillensis*, *P. brunneocystidiata*, *P. heimii*, *P. brasiliensis* (Fig. 705), *P. caerulescens* var. *ombrophila*, *P. yungensis*, *P. subaeruginascens*, *P. zapotecorum*, *P. hoogshagenii* var. *hoogshagenii* and *P. wassoniorum*. Finally, species common in the tropical rain forests are *P. singeri*, *P. weldenii*, *P. uxpanapensis*, and *P. veraecrucis* (all of them known only in Mexico), and also *P. plutonia* (in Brazil).

Concerning to the distribution of *P. caerulescens* var. *caerulescens*, from south-eastern U.S.A. to northern of South America, it is interesting to note that the climates in the southeaster U.S.A. and subtropical mountains of Mexico are indeed very similar. The average annual precipitation of the rain in Montgomery (Alabama), in New Orleans (Louisiana), and in Xalapa (State of Veracruz) is 50.6, 62.9 and 62.0 inches, respectively, data based in local climate reports in Alabama and Louisiana, and in Miranda & Sharp (1950). The vegetation through Montgomery to Xalapa is the same: a deciduous forests formed by *Liquidambar styraciflua*, *Carpinus carolinianus*, *Prunus serotina*, and other trees as *Quercus*. On the other hand, the soils observed by the author in Alabama are similar to those observed in Huautla de Jiménez, as clay or muddy orange-brown soils. The locality of Xalapa, mentioned in *P. caerulescens* var. *caerulescens* in the studied material of this fungus, is the first record in the State of Veracruz, as well as those materials from the State of Michoacan. *P. caerulescens* var. *caerulescens* seems common in the mountains of the Gulf of Mexico watershed to the Atlantic Ocean watershed in Venezuela, but rare in Southeastern U.S.A. *P. zapotecorum* that grow also in the Atlantic Ocean watershed, is more common in the Pacific Ocean watershed through northwest of Mexico to South America (Peru).

Species growing in gardens in temperate zones are *P. baeocystis* (Figs. 755 & 776), *P. stuntzii* (Plate 7 & Figs. 725 & 728), and *P. cyanescens* (Plate 8). The first occasionally grows in coniferous forests; *P. cyanescens* occasionally grows in deciduous forests, but all of them grow in temperate meadows. These species grow on soil or on wood debris.

Table 6 shows the distribution of species in connection with three types of considered forests: 1) tropical rain forests, 2) deciduous forests, and 3) coniferous forests. It seems that *Psilocybe* is very common in the deciduous forests. Following in importance the Coniferous forests and next in importance the tropical forest. Only *P. schultesii* and *P. armandii* are known from the tropical *Quercus* forest (both in Mexico). Many of the central European and the eastern North American species grow in deciduous forests, for example: *P. montana*, *P. phyllogena*, *P. semistriata*, *P. serbica* and *P. silvatica*. In Mexico, the deciduous forest, also called Mesophilous or Subtropical forests, have the majority of the known species of *Psilocybe*, particularly the hallucinogenic species.

The *Fagus* forests so common in the Central part of Europe and the eastern United States, are rare in Mexico. There is only one locality with such forest; it is in the

Table No. 7: Ecological distribution of some species of *Psilocybe*

species	forests	meadows	gardens
<i>P. andina</i>		X	
<i>P. argentina</i>		X	
<i>P. aztecorum</i> var. <i>aztecorum</i>	X		
<i>P. aztecorum</i> var. <i>bonetii</i>	X		
<i>P. baeocystis</i>			X
<i>P. borealis</i>	X		
<i>P. brasiliensis</i>	X		
<i>P. bullacea</i>	X	X	
<i>P. caerulescens</i> var. <i>caerulescens</i>		X	
<i>P. caerulescens</i> var. <i>ombrophila</i>	X		
<i>P. caeruleipes</i>	X		
<i>P. callosa</i>		X	
<i>P. coprophila</i>		X	
<i>P. crobula</i>	X	X	
<i>P. cubensis</i>		X	
<i>P. cyanescens</i>			X
<i>P. fimetaria</i>		X	
<i>P. hoogshagenii</i> var. <i>hoogshagenii</i>	X		
<i>P. hoogshagenii</i> var. <i>conveza</i>		X	
<i>P. inquilina</i>	X	X	
<i>P. merdaria</i>		X	
<i>P. mexicana</i>		X	
<i>P. muliercula</i>	X		
<i>P. pratensis</i>		X	
<i>P. semilanceata</i>		X	
<i>P. serbica</i>	X		
<i>P. silvatica</i>	X		
<i>P. singeri</i>			
<i>P. stuntzii</i>		X	X
<i>P. subcubensis</i>		X	
<i>P. subfimetaria</i>		X	
<i>P. uxpanapensis</i>	X		
<i>P. venenata</i>	X		
<i>P. veraecrucis</i>	X		
<i>P. weldenii</i>		X	
<i>P. wrightii</i>			
<i>P. yungensis</i>	X		
<i>P. zapotecorum</i>	X		

north eastern of Zacualtipan (State of Hidalgo), at 1700 m elevation. *P. fagicola* is endemic in this forest, but *P. fagicola* var. *mesocystidiata* grows only in the deciduous forests of *Liquidambar-Quercus* in other localities of the subtropical regions of Mexico. *P. montana* also grows in coniferous forests.

Psilocybe mexicana, *P. hoogshagenii* var. *hoogshagenii* and *P. zapotecorum* are common in the deciduous forests of Mexico, between 1000-2000 m elevation (Fig. 707), but sometimes it is possible to find these in the subtropical forests in transition to tropical forests at 1000 or 600 m elevation. *P. mexicana* was found at 600 m elevation near San José de Gracia (State of Veracruz) and *P. hoogshagenii* var. *hoogshagenii* in Chilapa (State of Oaxaca) at 700 m of elevation. Both localities are in subtropical forests, with *Platanus lindeniana* Mart. & Gal. near the river valleys. In Chilapa the trees: *Alvaradoa amorphoides* Liebm. and *Hymenaea courbaril* L. were identified, both are common trees to the tropical forests of the Mexican Pacific coast.

Referring to the pratical species, it is interesting to discuss *P. mexicana* (Fig. 655). This fungus is one of the most common hallucinogenic species in grasslands of the subtropical regions of Mexico (recently also reported from Guatemala); every time it grows only in meadows where horses have pastured. It seems that it grows on rich soils in connection with the horse dung, but never grows on dung. If this is true, then it is a problem to understand the ecological relationships between *P. mexicana* and the horses, because these animals arrived to Mexico through the Spanish Conquest in the XVI Century. *P. cubensis* and *P. subcubensis* are others interesting examples. They are fimicolous species on cattle dung and they are very common in subtropical (the first) and tropical (the latter) meadows of Mexico; then it is possible that these fungi were also introduced to American with the negroes trade established by the Spanish people in the XVI-XVII Centuries.

P. yungensis was described from Bolivia (South America) in a subtropical forest at 2000 m elevation (Singer & Smith, 1958 a,b). Later it was found in Mexico in the same type of vegetation (Heim & Wasson, 1958). This is a lignicolous or sublignicolous fungus (Fig. 722), typical of deciduous or subtropical forests in shady places. Heim & Wasson (*l.c.*) reported this species on stumps of *Persea americana* Mill., *Matayba clavelligera* Radlk., *Coccoloba pubescens* L., and *Ocotea veraguensis* (Meissn.) Mez in Huautla de Jiménez region at Mexico, but except for *Persea* the other trees are rare in the deciduous of subtropical forests of Mexico, but common in the tropics.

Relative to the ecology and distribution of the species, it is very important to call attention to the serious problem caused by the destruction of the vegetation, mainly in the tropical and subtropical forests in Latin America. Many lands originally covered by virgin or luxuriant forests now are meadows or covered by bushes or heaths if not barren and badly eroded. Murrill in the description of several species of mushrooms from Cordoba and Xalapa, both in the State of Veracruz, Mexico (Murrill, 1918) reported as type locality "habitat virgin forests"; but now, surrounding both localities it is impossible to find good forests. The type localities of

several species of Singer in South America, reported as forests, now are completely modified or the forests have disappeared, as the author noted in Colombia. The type localities for *P. uxpanapensis* and *P. weldenii* are, unfortunately completely changed; the virgin tropical rain forests that the author explored in 1976 now are poor meadows or poor agricultural lands, as he observed in 1978.

The tropical *Quercus* forests that were more or less common inside of the tropical rain forests of the South eastern sector of Mexico, as the author observed in 1953-1960, are now very difficult to find in their original condition. *Psilocybe schultesii* and *P. armandii* appear to be endemic of this type of vegetation, and they are exposed to the risk of being exterminated.

Regarding the geographical distribution of the species of *Psilocybe*, they occur on all continents, but from central Asia and from Central and South Africa there are not collections available in the herbaria. There are two possible reasons for this: 1) few collecting expeditions have been made to these areas for species of this genus; and 2) there are relatively few species in these areas. It is probable that the first consideration is the most exactly. It is interesting to observe that in Greenland, Lange (1948) found *P. subcoprophila*, *P. crobula* and *P. montana*. Horak (1967) described *P. fuegiana* collected by Spegazzini from Tierra del Fuego (Argentina), but this species also grows in northern Michigan.

The fimicolous or subfimicolous species such as *P. coprophila* (Fig. 679), *P. bullacea* and *P. merdaria* (Fig. 678), seem to have a widespread distribution like other cosmopolitan species, but it is interesting to observe that *P. coprophila* which is common in tropical and subtropical regions of the world, is apparently replaced in the temperate regions by *P. argentina* that has large spores (the size of the spores is the only difference between these two species). Some coprophilous species, however, have a distribution related to the climate. For instance, *P. cubensis* is a pan-tropical species. It was described from Cuba, and later found in Mexico and South America. Now it is known from almost all the subtropical regions of the world, except Africa where there is only one doubtful report. But *P. subcubensis*, a closely species, is only known from the tropical regions of the world (see discussion of *P. cubensis*).

P. semilanceata is known only in rich soil in temperate meadows, in North and South America and Europe, and one collection in Tasmania, but it is unknown in Mexico and Central America. *P. pseudobullacea*, *P. merdaria* and *P. moellerii* three closely species, have a large distribution from tropical meadows (the former) to temperate regions (*P. merdaria*) to cold regions the latter. In this connection, it is interesting to observe the variation of the size of the spores, smaller in the tropical species as *P. pseudobullacea*, to larger in the temperate and cold regions. *P. moellerii* is known only from temperate and cold climes, from Greenland to northwestern North America, and North of Europe. *P. merdaria* is known from temperate and subtemperate regions of the world, but it is unknown in Mexico. And *P. pseudobullacea* is a tropical species, first reported from Ceylon, subsequently from Mexico, Venezuela, Ecuador and New Guinea (see discussion of *P. pseudobullacea*).

Maps 1, 2 and 3 (Plates 4, 5 & 6, respectively) illustrate the distribution of the hallucinogenic species (Map 1), *P. inquilina* and *P. montana* (Map 2), and the distribution of *P. pseudobullacea*, *P. merdaria* and *P. moellerii* (Map 3). It is interesting to see that the hallucinogenic species of *Psilocybe* occur in all the continents, but particularly in South America, Mexico, U.S.A., Europe, Japan and Australia. Guzmán discussed the ecology and distribution of all the known species in South America (1978a) and in Mexico (Guzmán *et al.*, 1977; 1979) (and Guzmán, 1959a).

P. inquilina is known only from temperate regions as Europe, Northwestern of U.S.A., and Southern of South America. It is unknown in Mexico. *P. montana* has a wider distribution. It ranges from the cold regions of America (Alaska and Greenland) and North of Europe (Kola peninsula), to the temperate regions of Europe, U.S.A., Mexico, Colombia, Venezuela, Chile and Argentina. In Mexico this species is known only in high mountains with coniferous or mesophytic (deciduous) forests.

The formation of fairy rings in *Psilocybe* is known only in few species, such as in *P. fimetaria*, observed in by Nannfeldt in the field (specimen 23187 at UPS Herbarium)*, a fairy ring around 1 m in diameter. The formation of the fruit bodies in a fairy ring from the mycelium, is because all environmental conditions are suitable for reproduction, as stated Moore-Landecker (1972). These environmental conditions most subject to daily and seasonal fluctuation are light, temperature, and moisture. Fairy rings may continue to develop indefinitely, probably showing a continuous and steady source of nutrients, stated Cooke (1979).

With regard to the study of the ecology of *Psilocybe*, Guzmán (1959a) discussed the ecological conditions of the habitat and vegetation where several species of *Psilocybe* grow in Huautla de Jiménez region (State of Oaxaca). In this connection he discovered the same species of Huautla de Jiménez in other regions of Mexico as Xalapa (State of Veracruz) and Necaxa (State of Puebla), following the distribution of the deciduous forest, and the distribution of the same weather conditions. In that paper Guzmán supposed that *P. mexicana* grew in the States of Guerrero, Michoacán and Morelos, where it was later collected (Guzmán, 1968a), demonstrating the usefulness of the ecological studies in species distribution.

*The author observed a fairy ring in *P. cyanescens* of around 4 m in diameter, in the State of Washington, U.S.A.

THE HALLUCINOGENIC SPECIES

1. History of the hallucinogenic fungi*

The knowledge of hallucinogenic mushrooms as wrote the author in the Foreword of the book: "*Psilocybe* mushrooms and their allies" by Stamets (1978), has spanned four major periods of time. The first was the use of these mushrooms by the indigenous tribes of Prehispanic Mexico, whom we have read about in the writings of the sixteenth century. The second period, a time of confusion about the real identification of these mushrooms, lasted until the 1950s!. The third period consisted of mycological and ethnomycological expeditions proposing to taxonomically identify the hallucinogenic mushrooms and to become acquainted with the indigenous groups who used them, as well as their chemistry, and their application in medicine. This third period, no doubt is the golden age in the knowledge of hallucinogenic mushrooms, and is marked by the works of Reko, Schultes, Singer, Wasson, Heim, Smith, and Hofmann, among others. Finally, the present period is characterized by the use of hallucinogenic mushrooms by the young as a recreational drug and by psychologist proposing to study the human mind through the use of these peculiar organisms.

The hallucinogenic mushrooms, known also as wondrous, entheogens, psychotropic, neurotropic, sacred, or divine mushrooms or "teonanácatl" (= "divine mushroom" in the Nahuatl language), were reported for first time from Mexico after the Spanish Conquest in the XVI Century, by Sahagún, Motolinia, Francisco Hernández and other Spanish writers. They called attention to some mushrooms that the Mexican Indians knew as "teonanácatl" or "nanácatl" which were utilized as sacraments in special ceremonies.

Fray Bernardino de Sahagún, in his monumental work of several volumes: *Historia General de las cosas de la Nueva España*, written in 1499-1590 (Sahagún, 1955), was the first European writer who reported the existence of hallucinogenic mushrooms. He mentioned that the Indians eat some small black mushrooms which they call "teonanácatl" or "nanácatl". These grow under the grass of the fields and pastures, and they provoke visions when ingested. Sahagún reported these fungi in three parts of his work. First, in Book IX, Chapter VIII as "nanácatl", "honguillos

*The hallucinogenic fungi recently were named as entheogens by Ruck *et al.* (1979; see the note in the reference: Wasson *et al.*, 1978).

negros" (= little black mushrooms). Second, in Book X, Chapter XXIX, as "nanácatl", "hongos malos que emborrachan" (= evil mushrooms that inebriate), and Third in Book XI, Chapter VII, as "teonanácatl" "Hay unos honguillos en esta tierra que se llaman *teonanácatl*" (There are some little mushrooms in this land that they call *teonanácatl*).

It seems that another earliest writing on hallucinogenic mushrooms besides Sahagún's work (according to Wasson in Heim & Wasson, 1958) is "*Histoire du Mechiue*" by André Thévet, published in 1574. This work is a French translation of the lost work "*Antigüedades Mexicanas*" of Andrés de Olmos published in 1543. In this book the hallucinogenic mushrooms are called "*nandacatl*". Toribio de Benavente, also known as Motolinia, wrote *Historia de las Indias de Nueva España* in 1569. He also called the sacred mushrooms "*teonanácatl*" (= "carne de Dios o del Diablo": meat of God or of Satan) (see Aguirre Beltrán, 1955; Heim & Wasson, 1958). Francisco Hernández, the personal physician of the King of Spain, was in Mexico in 1570-1577 to study the plants of the New Spain. In his *Historia Plantarum Novae Hispanie*, published in 1790, he mentioned "teyhuinti", mushrooms that the Indians eat to get drunk, and see demons (Schultes, 1940; 1966; Schultes, in Ott & Bigwood, 1978; Heim & Wasson, 1958).

There are few other references to hallucinogenic mushrooms in Mexico and Central America. Wasson & Wasson (1957), Wasson (in Heim & Wasson, 1958) and Wasson (1980) review the history of hallucinogenic mushrooms in Mexico and Central America. One of the earliest papers of this century was that of Del Paso y Troncoso (1906) who recapitulated the writings of 1579-1582 of New Spain. He commented that Gaspar de Covarrubias, Governor of the Mines of Temascaltepec (Nevado de Toluca region, State of Mexico), reported in 1579, in the document *Relación de las Minas de Temascaltepec*, that Matlatzincas Indians get drunk with mushrooms. Almost 400 years later Guzmán & López-González (1970) and Escalante & López-González (1971) reported that the Matlatzincas Indians in San Francisco Oxtotilpan, a little town near to Temascaltepec (in Nevado de Toluca region), use *Psilocybe muliercula*, with the name "angelitos" (= little saints).

There are in Mexico several groups of Indians that use the hallucinogenic species of *Psilocybe* in special religious ceremonies, reminiscence from the Pre-Hispanic times. Actually we know using divine mushrooms the Mazatec, Zapotec, Chatino and Mije Indians in the State of Oaxaca, and the Nahuatl and Matlatzincas Indians in the State of Mexico. It is very probable that the Tarascan (or Purepecha) from the State of Michoacan used these mushrooms (Mapes *et al.* 1981), based in an old reference from Gilberti (1559) who mentioned the mushroom "cauiagua terékua" (= the mushroom that get drunk) (see below discussion on *Amanita muscaria* in Michoacan). (pag. 41). And also probable the Totonac and Huastec Indians, of the north-eastern Mexico (Wasson, 1980; Wasson & Wasson, 1957; Heim & Wasson, 1958). About the Maya Indians, there are the very interesting archaeological pieces, the "mushroom stones" as testimony of mushroom cult between them. Wasson (1980) presented a nice review of this interesting subject, that called attention from the last Century, for instance, Sapper in 1898 wrote referring to mushroom stones: "I would offer a suggestion. They resemble in shape mushrooms or toadstools, and

why should not that be their intention" (Wasson, 1980). See more information on the "mushroom stones" in the discussion of *P. singeri*, in the present monograph (pag. 92). See more information in Mayer (1977).

The identification of the "teonanácatl" was unknown for several centuries, despite the extensive ethnobotanical information from the XVI and XVII centuries. "Curiously enough, the actual utilization of mushrooms as intoxicants in modern Mexico was unobserved until very recently", wrote Schultes (1940). The first identification of "teonanácatl" as a mushroom was published by Schultes (1939), four centuries after Sahagún! However, Safford (1915) claimed that "teonanácatl" is only the "peyote" (*Lophophora williamsii* (Lem.) Coult.), a cactus with hallucinogenic properties common in the arid zones of the southwestern U.S.A. and northern of Mexico. This is of course, completely wrong. Blas Pablo Reko, an Australian physician who worked in Mexico in 1919, maintained that "peyote" and "teonanácatl" were not identical (Schultes, 1940, and Schultes in Ott & Bigwood, 1978; Reko, 1945). He wrote to Dr. J.N. Rose of the Smithsonian Institution in Washington, saying "teonanácatl" is a fungus which is still used by the Indians of Teotlalcingo, in Sierra de Juárez (Chinantla zone), in Oaxaca State, under the same ancient name. Unfortunately it seems that he did not collect any specimens. V.A. Reko, a journalist, cousin of B.P. Reko also in Mexico at that time, published a rather superficial book on intoxicants in 1936 in which he stated that the "nanácatl" (= mushrooms), referring to "teonanácatl", are poisonous and have nothing to do with "peyote". He thought they might be species of *Amanita* and invented the names "*Amanita mexicana*" and "*Amanita muscaria* var. *mexicana*" (Schultes, in Ott & Bigwood, 1978).

Robert J. Weitlaner of Mexico City collected for first time some ceremonially used mushrooms in Huautla de Jiménez, State of Oaxaca, in 1936. He sent samples of these mushrooms to B.P. Reko, who forward them to Harvard University for identification. Reko also sent some of Weitlaner's specimens to Santesson in Stockholm for chemical study. Santesson (in *Arkiv für Botanik* 29: 1-9, 1939) identified the mushrooms as probably belonging to *Panaeolus*. He reported negative results for alkaloids but a positive test for a glycoside. This is the first chemical report on hallucinogenic mushrooms (Schultes, in Ott & Bigwood, 1978). Another sample received by Santesson from Reko (Reko, 1945) was identified as *Armillariella mellea* (Vahl ex Fr.) Karst. but this is an edible mushroom very common in Mexico, similar to *Psilocybe cubensis* (Earle) Sing. in form and in the presence of a ring on the stipe.

In his studies of the Zapotec and the Chinantec Indians Reko (1945; 1949) reported several popular names for the hallucinogenic mushrooms (see part 5 of this Chapter). In all the cases he identified them as *Panaeolus* spp. One name "a-mo-kia", reported by Reko (1949) from Latana, a town near Choapan and Playa Vicente, may be belongs to one or more species of *Psilocybe*. Latana, is close to the Tuxtepec-Ixtlán de Juárez road, where Guzmán recently collected *P. yungensis*, *P. zapotecorum* and *P. heimii*.

Schultes, during his trips to Oaxaca with B.P. Reko, found a prevalence of mushrooms rites. They collected several specimens in Huautla de Jiménez. One sample

was identified at Harvard University as *Panaeolus campanulatus* var. *sphinctrinus* (Fr.) Bres. (= *Panaeolus sphinctrinus* (Fr.) Quél.), and this was the first identification of the “teonanácatl” (Schultes, 1939). Another specimen, belonging to another sample, was identified as *Panaeolus acuminatus* (Schaeff. ex Fr.) Quél. by A.H. Smith (Reko, 1945). The third sample of mushrooms collected by Schultes and Reko in 1939 and deposited at Harvard University Herbarium, was identified by Singer (1949) first as “*Stropharia caerulescens* Imai (*Stropharia venenata* Imai, *Stropharia cyanescens* (Murrill) - probably” and later as *Psilocybe cubensis* (Earle) Sing. (see Fig. 43 of Heim & Wasson, 1958). The author checked this sample (Schultes & Reko 349 at FH) at Harvard University in 1972 and agrees that it is *P. cubensis*. Also in FH the author found another sample, not reported by Schultes, neither by Singer or by Heim & Wasson. This sample is *Psilocybe caerulescens* Murr. var. *caerulescens*!, and has the same popular name, “kee sho” as the others. This sample was collected in Huautla de Jiménez by Reko and Schultes in July 1938, but the notes and drawing made by Schultes on the sample 349 surely belong to this sample, for the form of the fungus and the not annulus. The popular name “kee sho” writing by Schultes in his notes and later reported (1939) as “she to” is similar with the true popular name “di ki sho” of *P. caerulescens*.

All the above-mentioned fungi are common in Huautla de Jiménez. *Panaeolus sphinctrinus* and other *Panaeolus*, as well as *Armillariella mellea* were not observed by the author, even after spending several months in that region during 1957, 1958 and 1959, to be use as hallucinogenic fungi. The Mazatec Indians say that the species of *Panaeolus* are not good for eat, “son malos” (they are dangerous or poisonous). For *Armillariella mellea* they say is edible. *Psilocybe cubensis* and *P. caerulescens* var. *caerulescens* are consider by the Indians as sacred or divine mushrooms in Huautla de Jiménez, but they say that *P. cubensis* is the less sacred. They call *P. cubensis* “San Isidro Labrador” (a Spanish Saint)*, and the other species they call “di ki-sho” in Mazatec, or “derrumbito” in Spanish (both mean “the fungus of the landslide”, referring to its habitat). Schultes (1939) originally reported only *Panaeolus sphinctrinus*, based in the sample Schultes & Reko 231 in the Farlow Herbarium, with the popular name “she to”. The identification of *Psilocybe cubensis* by Singer was based on the sample Schultes & Reko 349, with the popular name “kee-sho”.

It is interesting to see that the collection of *P. caerulescens* var. *caerulescens* belongs to one of the most important sacred mushrooms between the Mazatec Indians. *P. cubensis* seems not to be so popular. Very probable because was introduced among the Indians by the cattle brought over during the Spanish Conquest. In this connection it is interesting to observe that *P. cubensis* is the only hallucinogenic fungus with a popular name of a Spanish Saint.

Singer (1949) was the first to call the attention to the use of *Psilocybe* as inebriants. Unfortunately it was a very short note, based in his observations on Reko and

Schultes's fungi; “at least one species is used as a drug in Mexico (causing a temporary narcotic state of hilarity) but is poisonous when used in excess” (Singer, 1949, p. 506). However in *Panaeolus* (p. 472, l.c.) he wrote: *Panaeolus sphinctrinus* and *P. papilionaceus* are used as intoxicating drugs in Central America by certain populations, together with *Psilocybe cubensis*”.

Modern knowledge of hallucinogenic mushrooms began in 1953 when Wasson, in collaboration with his wife, explored Mexico looking for the “teonanácatl”. They found, with the help of Schultes' and Reko's papers, and the earlier Spanish writing discussed above, and with the help of some anthropologists and ethnologists working in Mexico, much interesting in the use of fungi. R.J. Weitlaner, and his daughter I. Weitlaner Johnson, G. Stresser-Péan, C. Cook de Leonard, W.S. Miller, S. Hoogshagen, B. Upson, and others, helped the Wasson's in their research in Mexico. All the fungi collected by the Wassons were sent to Heim at Paris. From these Heim (1956a, 1956b) published his first papers on hallucinogenic fungi, and in 1956 and 1957 he and Wasson explored Central and Eastern Mexico (Heim, 1957a; 1957b; 1957c; 1957d) for hallucinogenic fungi and their use. Wasson & Wasson (1957) published *Mushrooms, Russia and History* where, in the chapter titled *Teonanácatl*, they presented all their researches on the hallucinogenic mushrooms. Wasson (1957) also wrote one of the first popular papers on the Mexican hallucinogenic mushrooms where with Heim, they described the main hallucinogenic species of the genera *Psilocybe*, *Stropharia** and *Conocybe* known in that time.

In 1959 Heim and Wasson published *Les champignons hallucinogènes du Mexique* (Heim & Wasson, 1958), where they summarized their research on the subject. In this work A. Hofmann, R. Cailleux, A. Cerletti, A. Brack, H. Kobol, J. Delay, P. Pichot, Th. Lemperiere and P.J. Nicolas-Charles made, along with Heim and Wasson, important contributions to the history, ethnomycology, taxonomy, culture methods, chemistry and psychic effects of these fungi.

Latter, Wasson (1959) presented a review of his ethnomycological exploration in Mexico, and more late (1962) the complex bibliography on the hallucinogenic mushrooms, from the primary sources in the sixteenth century to 1962. Recently (1980) Wasson published a very interesting book where he discuss the use of the mushrooms by the Indians in Mexico.

Singer came to Mexico in the summer of 1957 to study the hallucinogenic mushrooms. The author had the opportunity of helping Singer in the field. Singer (1958a-b, 1959a) published his observations, and together with Smith (Singer & Smith, 1958a-b), presented a monograph of the Section *Caerulescentes* of the genus *Psilocybe*, with all the known hallucinogenic species in the world. This was the first report of hallucinogenic fungi in South America, U.S.A., Europe and Java, based in part on the earlier papers of Earle (1906), Murrill (1923), Höhnelt (1914) and Wakefield (in Dennis & Wakefield, 1946), who described several species, but none

*The Mazatec name for this fungus is “di ki-sho le rra-ja”, which means “the fungus like those that grow on cow dung”.

*The only species of *Stropharia* considered by Heim and Wasson belongs to *Psilocybe cubensis* (Earle) Sing.

of these earlier authors noted any hallucinogenic properties of the species. Singer & Smith did not include *P. semilanceata*, a very important hallucinogenic species in Europe and northwestern North America. Heim *et al.* (1967) presented new researches on the hallucinogenic mushrooms from Mexico and other parts of the world, and he described the hallucinogenic species *Psilocybe kumaenorum* from New Guinea and *P. semilanceata* from Europe.

P. semilanceata was described from Europe in the beginning of the last Century (Fries, 1836), but it was Heim (1963, 1971, and in Heim *et al.*, 1967) who first reported this species as hallucinogenic. He based on a very interesting report in 1803 by Sowerby (see discussion of *P. semilanceata*) who reported a hallucinogenic intoxication in one man and four children in 1799 in England (see Heim, 1971).

Guzmán in 1956 initiated his study on the taxonomy and distribution of the Mexican hallucinogenic mushrooms, but in 1957 he learned from Singer in Huautla de Jiménez and other localities of Central Mexico how to study the agarics. The first ecological report on the hallucinogenic species was published by Guzmán (1958), describing the habitat of *P. muliercula*, only known at that time from the market of Tenango del Valle. In 1959 he presented his professional thesis on the ecology and distribution of the Mexican hallucinogenic fungi (Guzmán, 1959a). Short papers from this work were published later (Guzmán, 1959b; 1960; 1961). He reported for first time hallucinogenic species from Xalapa and Necaxa (Mexico), as well as from Honduras (Central America). He found that "teotlaquilinanacatl" was a name used in Necaxa region for the hallucinogenic mushrooms (see part 5 of these chapter). Guzmán described (1968 a-b) two new species, and later with the collaboration of López-González, found that the Matlatzincas Indians in the Nevado de Toluca region used hallucinogenic fungi (Guzmán & López-González, 1970) (see also Escalante & López-González, 1971). He began this present monograph in 1971 published several papers on the taxonomy, distribution and uses of these species in collaboration with Bas, Horak, López, Ott, Pérez-Ortiz, Pollock, Stamets, Smith, Vergeer and Watling (see Guzmán *et al.* 1976, 1977, 1978, 1979, 1980).

In 1958, in a very small town call Rancho El Cura, near Huautla de Jiménez, Guzmán ate hallucinogenic fungi (*P. cubensis*) in an Indian religious ceremony held during the night. His hallucinogenic experiences in color were very surprising. He saw people, friends and relatives, who they talked to him, although he known that he was alone sitting on the ground in a corner of an Indian house. During all this time a "human castle" stood in another corner, smiling and saying "came to me, do not be afraid". This castle was his mushroom dryer.

There is an interesting church in Mexico built in honor to a fungus; this church seems to be unique in the world. In 1961 the author, with the information provided by Dr. A. Barrera, discovered this Church where a fungus is the principal part in the cult. This important church was later studied by Guzmán, Wasson and Herrera (1975). It is located in Chignahuapan, State of Puebla, and was built especially for the worship of a fungus, identified by Guzmán as *Ganoderma lobatum* (Schw.) Atk., a lignicolous species remotely related to the hallucinogenic mushrooms. The

fungus or "honguito" (= little mushroom), carries on its face an arresting sketch where a figure of Christ with the sun on the left and the moon on the right and the number 80 are more or less evident. This worship of the fungus maybe is in connection with the use of hallucinogenic mushrooms. It is probably that the people of the church call the attention of the Indians through the Christ on the *Ganoderma*. Guzmán *et al.* (l.c.) think that hallucinogenic species of *Psilocybe* are used in the Northeastern of Chignahuapan, where there are ecological conditions for the growth of *Psilocybe* species.

The works of Heim & Wasson (1958) and Singer & Smith (1958b) initiated a series of modern investigations on hallucinogenic mushrooms. Cultural and chemical studies were made in the Europe, U.S.A., and Australia. In this latter country, Hall (1973), Picker & Richards (1970) and Southcott (1974) show the use of hallucinogenic mushrooms as recreational drugs and Guzmán & Watling (1978) made a critical analysis of *Psilocybe* in Australia. In France, for instance, Bazante (1971) tested psilocybin on spiders to observe its effect on webs construction. The publicity surrounding these discoveries has not led to uniformly beneficial results. Huautla de Jiménez has changed, from a quite, clean and mysterious town before 1957 (in this year Wasson published the article if *Life* magazine), to a commercial and dirty town. Many foreign people, mainly young North Americans so-called "hippies" came to Huautla de Jiménez to eat mushrooms and to meet Maria Sabina, the *sabia* (= wisewoman), the *curandera* (= medicar), or the *bruja* (= witch) that is the shaman woman who showed Wasson in 1955 how to use the sacred mushrooms. Latter Wasson *et al.* (1974) presented a complete book on the transcription of the use of the sacred mushrooms by Maria Sabina, even with the musical transcription records of Maria Sabina's velada.

Benitez in 1964 (1979) published a book in Mexico where he described the use of the hallucinogenic mushrooms of Huautla de Jiménez, following Wasson's research. Herrera (1967) wrote about a velada with Maria Sabina in Huautla de Jiménez, together with Dr. M. Ishikawa. The latter (1973) presented in 1973 and 1974 his experiences in two Japanese magazines with very interesting information. Cerletti (1959, 1961), Delay *et al.* (1961), Deysson (1961) and Hofmann (1969) presented a good review of the knowledge of the hallucinogenic fungi and the use in medicine. Castañeda (1968) published in a confused report on the use of *P. mexicana* among the Tarahuamara Indians. He stated that Don Juan, his Indian teacher smoke the dried mushrooms, but this seems not correct. Guzmán (1978d) presented a summary of the most important hallucinogenic mushroom in Mexico. Lowy (1968, 1971, 1972, 1974) described the mushroom symbolism in the Mayan culture; he reported on mushroom stones and reported the first record of *P. mexicana* from Guatemala. In this connection the report of Guzmán (1979a) that hallucinogenic fungi occur in the tropics, in Uxpanapa region, adjacent to the Mayan zone (see *P. uxpanapensis*, *P. singeri*, *P. weldenii*) is of interest. Lipp (1971) and Rubel & Gettelfinger-Krejci (1976) reported the use of hallucinogenic fungi among the Chinantec Indians in Oaxaca confirming the early observations of Reko (1949). Hoog- hagen (1959), Miller (1966) and Ravicz (1960) presented an interesting review of the

use of the hallucinogenic fungi between the Mijes and Mixtec Indians. Of these papers, Hoogshagen's present a further study of the Mije Indians of Coatlán, State of Oaxaca where Heim (1956a) and Heim & Wasson (1958) described *P. cordispora* and *P. mixaeensis* (= *P. caerulea* var. *ombrophila*).

There are few reports of the use of hallucinogenic fungi by the Indians outside of Mexico. Heim (in Heim *et al.*, 1967) reported the use of *P. kumaenorum* in New Guinea, and Singer (1958d, 1960b) and Singer *et al.* (1958) reported the use of *Russula* also from New Guinea as it will be discussed below. The only South American report is from Schultes (1966), who thinks that the reported by Jesuits in the late XVII and early XVIII Centuries of a "tree fungus" used by the Yurimagua Indians in the western Amazona, Peru is probably *Psilocybe yungensis*. Recently Schultes (1979) discussed ancient gold pectoral from Colombia as possible mushroom effigies in connection with a possible use of hallucinogenic mushrooms in Colombia.

In South America Llorca Izquierdo (1972) reported the use of hallucinogenic fungi (*P. cubensis*) as recreation in Venezuela. There are many popular books published in U.S.A. about the use of these mushrooms as drug (Harris 1976; Oss & Oeric, 1976; Haard & Haard, 1977; Pollock, 1977; Miller & Tatelman, 1977). A few are fairly good reviews of the hallucinogenic species, e.g., Schultes (1976), Schultes & Hofmann (1979), Furst (1976), Menser (1977), Lincoff and Mitchel (1977) and Stamets (1978). Recently Ott & Bigwood (1978) gave a summary of the main research on hallucinogenic fungi. Hofmann, Schultes, Wasson, and Weil present their results on the chemical, ethnology, history, and medicinal aspects of these mushrooms in Ott & Bigwood's book.

2. The known hallucinogenic fungi and their distribution in the world

Psilocybe is not the only genus having hallucinogenic properties, but it has the greatest number of psychotropic species, and some of its species are those used ritually by the Mexican Indians. *Amanita muscaria* (L. ex Fr.) Hook. is an hallucinogenic, but toxic mushroom, used by a primitive tribe on the Kamchatka peninsula in Asia (Wasson & Wasson, 1957). This fungus is very easy to recognize and consequently its poisonous properties were early known. They attributed to it powers beyond its possession (Ramsbottom, 1954). There is a fresco in a ruined chapel at Plaincourault (Indre, France), from 1291, where is represented the tree of good and evil that presumably is *Amanita muscaria* with a serpent on it and with Eve on one side (Wasson & Wasson, 1957; Ramsbottom, 1954). On the other hand, Lowy (1972; 1974) think that *A. muscaria* was used by the Maya Indians in religious ceremonies, but Guzmán did not find any use of this mushroom between the Mexican Indians, except a stone figure found in an archaeological place in Pátzcuaro, Michoacan (Mexico) that seems represent a bottom of *A. muscaria* (Mapes *et al.*, 1981). Moderately *A. muscaria* is a drug in U.S.A. and Canada as the author observed in the Northwest.

Reports on the hallucinogenic properties of *Panaeolus* are confused. *P. subbalteatus* (B. & Br.) Sacc. is reported by Singer *et al.* (1958) as having psychotropic substances. Ola'h (1969) reported the presence of psilocybin in *P. sphinctrinus* (Fr.) Quél. in small amounts. However, in Mexico no *Panaeolus* is used as sacred or divine mushroom among the Indians of Oaxaca (Mazatecs, Chatinos, Zapotecs, Mijes) and the State of Mexico (Nahuas), in spite of fact that the species of *Panaeolus* are very common (Guzmán & Pérez-Patracá, 1972).

Russula nondorbingi Sing. and *R. wahgiensis* Sing. have been reported by Singer (1958d, 1960b) as psychotropic fungi used by primitive people in New Guinea, but not other reports are found in the bibliography to confirm this interesting case unique in the genus *Russula*.

Cordyceps capitata (Holmskjöld ex Fr.) Link and *C. ophioglossoides* (Ehrenb. ex Fr.) Link are used in religious ceremonies between the Nahuas Indians from the Nevado de Toluca region (Mexico). They also use *Psilocybe muliercula* Sing., *Elaphomyces granulatus* Fr., and *E. reticulatus* Vitt. Except for a few comments in Heim & Wasson (1958), Guzmán (1978d; 1979a), and Trappe *et al.* (1979), there are no reports on the hallucinogenic properties, and no chemical analysis, of these fungi, except for *P. muliercula*. The Indians eat only one of the three fungi (*Psilocybe*, *Cordyceps* or *Elaphomyces*) but never at the same time, and they say that *Elaphomyces* is the centre of the ceremony. It is interesting to note that *Cordyceps* is very close to *Clavipes purpurea* (Fr.) Tul., a parasite of the rye, and a source of LSD, an hallucinogenic drug (see Schultes & Hofmann, 1973, and Ott & Bigwood, 1978). In this connection, Wasson *et al.* (1978) wrote an interesting book on the mysteries on the use of *Claviceps purpurea* in Eleusis, an ancient Greek city; this fungus in fact produces physical symptoms with visions.

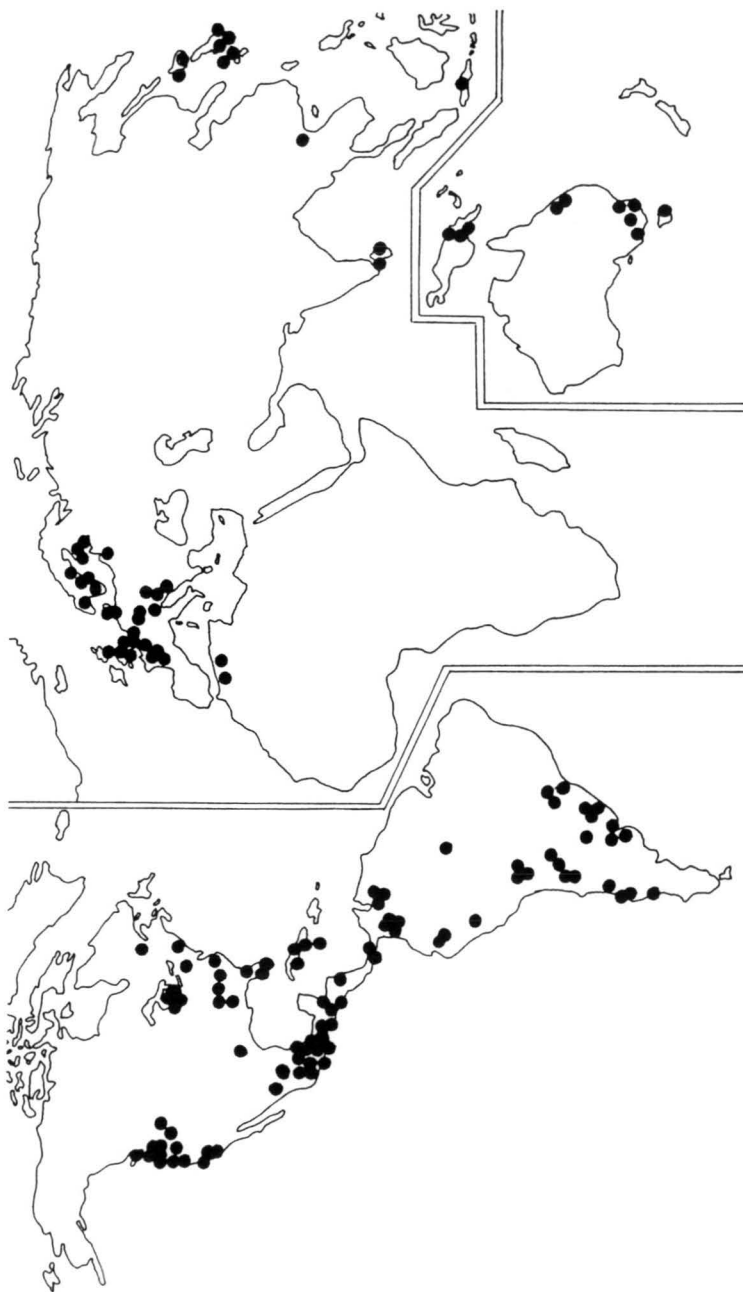


Table No. 8. Distribution of the Hallucinogenic species of *Psilocybe* in the World

Number of species by geographical region
(see Map 1, Table 4)

MEXICO.....	32
CENTRAL & SOUTH AMERICA (including the Caribbean zone, but excluding Mexico).....	26
CANADA & U.S.A.....	18
AUSTALASIA.....	13
ASIA.....	9
EUROPE.....	8
AFRICA.....	1

Returning to *Psilocybe*, there are three important features which generally distinguish the hallucinogenic species, 1) the bluing reaction in the carpophore, 2) the farinaceous flavor, and 3) the farinaceous odor. However, these are sometimes difficult to observe, especially when the specimens are very old or dry. Only occasionally these features are observed in dry herbarium specimens.

There are 81 hallucinogenic species of *Psilocybe* of the 144 considered in the genus, as is shown in the table 10. They are distributed through the world (see table 8 and map 1 of the table 4). Of these, all the species of the Sections *Cordisporae*, *Semilanceatae*, *Brunneocystidiatae*, *Zapotecorum*, *Mexicanae*, *Cyanescens*, *Stuntzae*, *Aztecorum* and *Cubensae* are hallucinogenic, and only one of the Section *Subaeruginosae* (see table 9). All these fungi together, belong to the old Section *Caerulescentes* Sing. (Singer, 1948).

The Section *Cordisporae* is the most important for the great number of species, and at least in Mexico is the most common, mainly in the subtropical mountains between 1000-2000 m elevation, where the Indians of the State of Oaxaca are located. The Section *Subaeruginosae* only represented by *P. subaeruginosa* is known only in the eastern of Australia. Species of Section *Semilanceatae* are found only in temperate regions, both boreal and austral zones. They are unknown in the subtropics and tropics, except for *P. caerulipes* which is very common in the eastern North America, but also in one locality in Mexico, in a *Fagus* forest. *P. semilanceata* has a

Plate 4: Map 1. Distribution of the hallucinogenic species of *Psilocybe* in the world (see the tables 8 & 10).

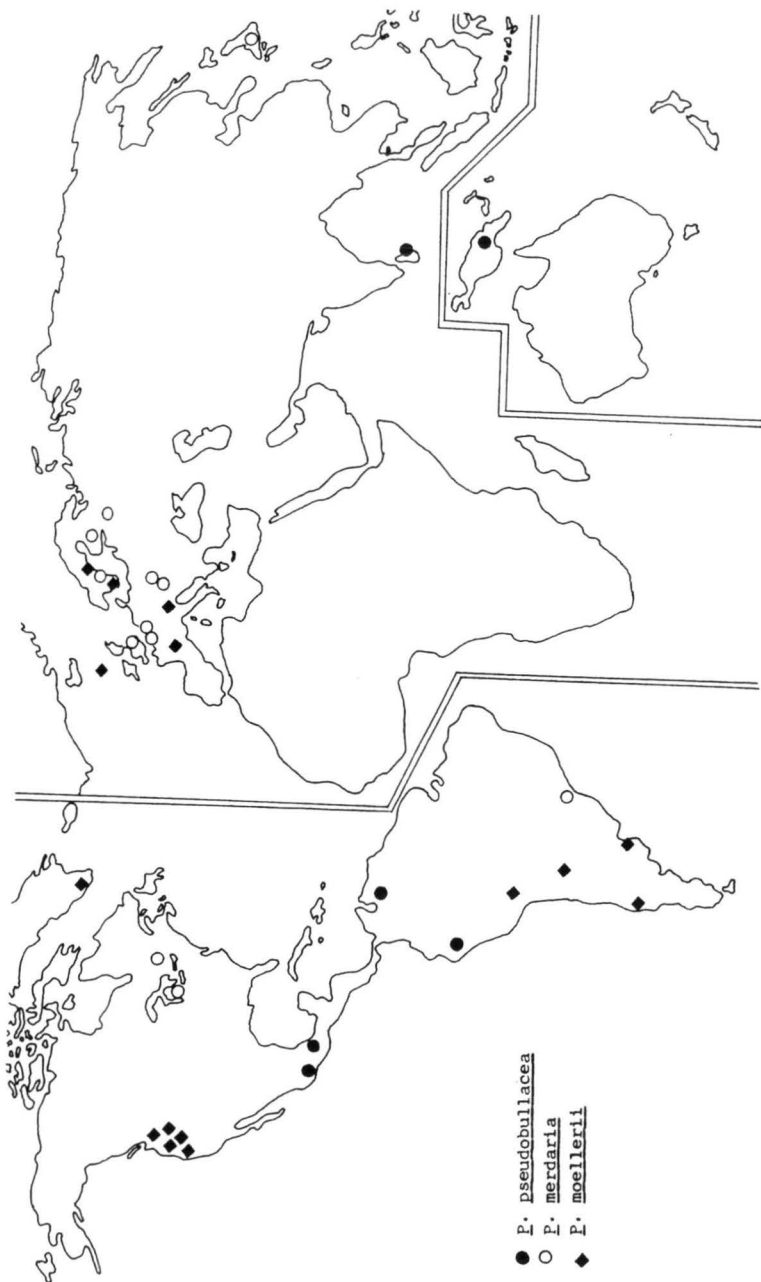


Table No. 9. Number of Hallucinogenic species of *Psilocybe* by Sections

Section <i>Cordisporae</i>	26
Section <i>Semilanceatae</i>	13
Section <i>Brunneocystidiatae</i>	10
Section <i>Zapotecorum</i>	9
Section <i>Mexicanae</i>	6
Section <i>Cyanescens</i>	5
Section <i>Stuntzae</i>	5
Section <i>Aztecorum</i>	4
Section <i>Cubensae</i>	2
Section <i>Subaeruginosae</i>	1
Total:	81

widespread distribution; it is known from 17 countries (see table 10), but not from Mexico and Central America. The locality in Tasmania (Guzmán & Watling, 1978) is probably a temperate region in a high mountain.

The species of the Section *Brunneocystidiatae* are common in the tropical rain forest, all of them recently described (see Guzmán 1978c, 1979; Guzmán & Horak, 1978b). It is very probable that there are more unknown species in the tropical zones. The author thinks that the Section *Brunneocystidiatae* is largest in the genus, but unfortunately, almost all the known species of this Section grow in forests and since the tropical forests of the world, are disappearing especially those of Latin America, many species will also probable disappearing before mycologists can study them.

Mexico has the most species of hallucinogenic fungi belong to *Psilocybe* (see table Nos. 8 and 10 and map 1). Of the 81 known species, 32 grow in Mexico, 26 in Central and South America (including the Caribbean zone), 18 in Canada and U.S.A., 13 in Australasia (Australia, Tasmania, New Guinea), 9 in Asia (mainly in Japan), 8 in Europe, and only one in Africa (*P. maire* from Morocco and Algeria).

Plate 5: Map 2. Distribution of *Psilocybe pseudobullacea* (Petch) Pegler, *P. merdaria* (Fr.) Ricken, and *P. moellerii* Guzmán.

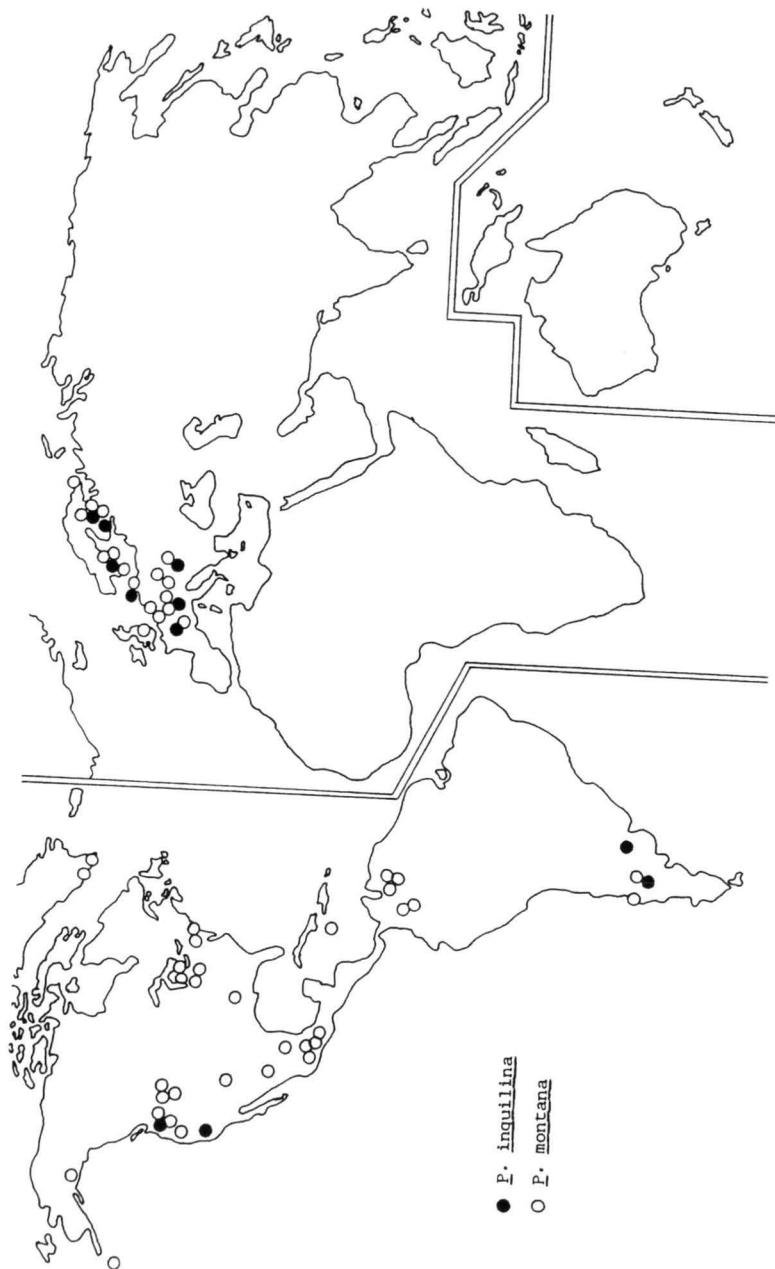


Table No. 10. The Hallucinogenic species of the Genus *Psilocybe* and their distribution in the World*

Species	Countries
Section <i>Brunneocystidiatae</i>	
<i>P. banderillensis</i> Guzmán	MEXICO
* <i>P. brunneocystidiata</i> Guzmán & Horak	PAPUA NEW GUINEA
<i>P. heimii</i> Guzmán	MEXICO
* <i>P. inconspicua</i> Guzmán & Horak	PAPUA NEW GUINEA
<i>P. pleurocystidiosa</i> Guzmán	MEXICO
<i>P. rzedowski</i> Guzmán	MEXICO
<i>P. singeri</i> Guzmán	MEXICO
<i>P. uxpanapensis</i> Guzmán	MEXICO
<i>P. veraecrucis</i> Guzmán & Pérez-Ortiz	MEXICO
<i>P. weldenii</i> Guzmán	MEXICO
Section <i>Subaeruginosae</i>	
<i>P. subaeruginosa</i> Clel.	AUSTRALIA
Section <i>Cordisporae</i>	
<i>P. brasiliensis</i> Guzmán	BRAZIL
<i>P. caerulescens</i> Murr. var. <i>caerulescens</i>	U.S.A., MEXICO
	PANAMA, VENEZUELA
<i>P. caerulescens</i> var. <i>ombrophila</i> (Heim) Guzmán	MEXICO
<i>P. columbiana</i> Guzmán	MEXICO
<i>P. cordispora</i> Heim	MEXICO
<i>P. dumontii</i> Sing. ex Guzmán	PANAMA
<i>P. fagicola</i> Heim & Cailleux var. <i>facicola</i>	MEXICO
<i>P. fagicola</i> var. <i>mesocystidiata</i> Guzmán	MEXICO
* <i>P. fuliginosa</i> (Murr.) Smith	JAMAICA
<i>P. furtadoana</i> Guzmán	BRAZIL
* <i>P. goniospora</i> (B. & Br.) Sing.	CEYLON
<i>P. herrerae</i> Guzmán	MEXICO
<i>P. hoogshagenii</i> Heim var. <i>hoogshagenii</i>	MEXICO, ARGENTINA
<i>P. hoogshagenii</i> var. <i>convexa</i> Guzmán	MEXICO
* <i>P. jacobsonii</i> Guzmán	MEXICO
* <i>P. lonchophorus</i> (B. & Br.) Horak ex Guzmán	CEYLON
<i>P. mammillata</i> (Murr.) Smith	U.S.A., JAMAICA, MEXICO, BOLIVIA

Plate 6: Map. 3. Distribution of *Psilocybe inquilina* (Fr. ex Fr.) Bres., and *P. montana* (Pers. ex Fr.) Kummer.

* <i>P. ochreate</i> (B. & Br.) Horak ex Guzmán	CEYLON	<i>P. graveolens</i> Peck	U.S.A.
* <i>P. papuana</i> Guzmán & Horak	PAPUA NEW GUINEA	<i>P. kumaenorum</i> Heim	PAPUA NEW GUINEA
* <i>P. plutonia</i> (B. & C.) Sacc.	CUBA, VENEZUELA	<i>P. muliercula</i> Sing. & Smith	MEXICO
	BRAZIL	<i>P. pintonii</i> Guzmán	COLOMBIA
* <i>P. schultesii</i> Guzmán & Pollock	MEXICO	<i>P. subcaerulipes</i> Hongo	JAPAN
<i>P. subyungensis</i> Guzmán	VENEZUELA	<i>P. zapotecorum</i> Heim emend. Guzmán	MEXICO, PERU, BRAZIL,
<i>P. wassoniorum</i> Guzmán & Pollock	MEXICO		CHILE, ARGENTINA
<i>P. wrightii</i> Guzmán	ARGENTINA		
<i>P. xalapensis</i> Guzmán & López	MEXICO		
<i>P. yungensis</i> Sing. & Smith	BOLIVIA, COLOMBIA		
	ECUADOR, MEXICO		
Section <i>Mexicanae</i>		Section <i>Aztecorum</i>	
<i>P. acutipilea</i> (Speg.) Guzmán	BRAZIL	<i>P. aztecorum</i> Heim emend. Guzmán var.	MEXICO
<i>P. armandii</i> Guzmán & Pollock	MEXICO	<i>aztecorum</i>	
<i>P. farinacea</i> Rick ex Guzmán	BRAZIL	<i>P. aztecorum</i> var. <i>bonetii</i> (Guzmán)	MEXICO
<i>P. galindii</i> Guzmán	MEXICO	Guzmán	
<i>P. mexicana</i> Heim	MEXICO, GUATEMALA	<i>P. baeocystis</i> Sing. & Smith emend.	CANADA, U.S.A.
<i>P. tampanensis</i> Guzmán & Pollock	U.S.A.	Guzmán	
		<i>P. quebecensis</i> Ola'h & Heim	CANADA
Section <i>Stuntzae</i>		Section <i>Cyanescens</i>	
<i>P. caeruleoannulata</i> Sing. ex Guzmán	BRAZIL, URUGUAY	* <i>P. australiana</i> Guzmán & Watling	AUSTRALIA
<i>P. stuntzii</i> Guzmán & Ott	U.S.A.	<i>P. cyanescens</i> Wakef.	ENGLAND, HOLLAND,
<i>P. subaeruginascens</i> Höhnelt var.			U.S.A., CANADA
<i>subaeruginascens</i>	JAPAN, JAVA	* <i>P. eucalypta</i> Guzmán & Watling	AUSTRALIA
<i>P. subaeruginascens</i> var. <i>septentrionalis</i>		<i>P. maire</i> Sing.	MAROCOCO, ALGERIA
Guzmán	JAPAN	* <i>P. tasmaniana</i> Guzmán & Watling	TASMANIA, AUSTRALIA
* <i>P. uruguayensis</i> Sing. ex Guzmán	URUGUAY		
Section <i>Cubensae</i>		Section <i>Semilanceatae</i>	
<i>P. cubensis</i> (Earle) Sing.	U.S.A., CUBA, MEXICO	<i>P. caerulipes</i> (Peck) Sacc.	U.S.A., MEXICO
	GUATEMALA, BOLIVIA,	<i>P. callosa</i> (Fr. ex Fr.) Quél.	CANADA, U.S.A., CHILE,
	BRAZIL, ARGENTINA,		CZECHOSLOVAKIA,
	VIETNAM, AUSTRALIA		ENGLAND, FINLAND,
<i>P. subcubensis</i> Guzmán	MEXICO, COLOMBIA,	<i>P. carbonaria</i> Sing.	CHILE
	BOLIVIA, ECUADOR,	<i>P. cyanofibrillosa</i> Guzmán & Stamets	U.S.A.
	HONDURAS, EL SALVADOR,	<i>P. fimetaria</i> (Orton) Watling	CANADA, U.S.A., CHILE,
	VENEZUELA, AUSTRALIA		CZECHOSLOVAKIA,
			DENMARK, ENGLAND,
Section <i>Zapotecorum</i>			FINLAND, SWEDEN
<i>P. angustipleurocystidiata</i> Guzmán	MEXICO	* <i>P. liniformans</i> Guzmán & Bas var.	
<i>P. argentipes</i> Yokoyama	JAPAN	<i>liniformans</i>	HOLLAND
<i>P. collybioides</i> Sing & Smith	ARGENTINA	<i>P. liniformans</i> var. <i>americana</i> Guzmán	U.S.A.
		& Stamets	

P. pelliculosa (Smith) Sing & Smith
P. semilanceata (Fr. ex Secr.) Kumm.

P. serbica Moser & Horak

P. silvatica (Peck) Sing. & Smith
P. subfimetaria Guzmán & Smith
P. venenata (Imai) Imaz. & Hongo

CANADA, U.S.A.,
 FINLAND
 CANADA, U.S.A., CHILE,
 AUSTRIA, BELGIUM,
 CZECHOSLOVAKIA,
 DENMARK, ENGLAND,
 FINLAND, FRANCE,
 GERMANY, HOLLAND, ITALY
 NORWAY, SWEDEN,
 U.R.S.S., TASMANIA
 CZESHOESLOVAKIA,
 YOGOSLAVIA
 U.S.A., FINLAND, SWEDEN
 CANADA, U.S.A., CHILE
 JAPAN

*Those species marked with an asterik are doubtfully hallucinogenic because they only are known by herbarium materials.

3. Cultural and chemical investigations

Several hallucinogenic species of *Psilocybe* have been cultured in the laboratory by different mycologists as Heim and Cailleux (see Heim & Wasson, 1958), Singer (1958b), Singer *et al.* (1958), Zenteno & Herrera (1958), Cuevas & Herrera (1971), Ulloa & Herrera (1967), Guzmán (1959a), and Casas-Campillo (see Esparza-García, 1979). But the not hallucinogenic species have been also cultured (McKnight, 1953, 1971; Watling, 1971) as will be discuss later.

Dubovoy and Herrera (1967, 1968a, 1968b) studied the development of the mycelium of *P. caerulescens* var. *caerulescens* (see pag. 114).

It is relatively easy to get cultures of *Psilocybe*, because is a saprophytic fungus. Many amateurs obtain cultures and even fruit bodies, mainly of *P. cubensis* which is one of the most popular and easy species to get culture. Oss & Oeric (1976), Pollock (1977), and Bigwood (in Ott & Bigwood, 1978) present the cultivation techniques to get cultures of *Psilocybe*, mainly *P. cubensis*, as the agar preparations for spore germination, isolation and germination of spores, inoculations, fruiting, compost cultivation, etc. Recently, Badham (1980) studied the effect of light in the formation of basidiocarp in *P. cubensis*; fruiting occurred only when cultures were illuminated.

Cailleux & Heim (in Heim & Wasson, 1958) obtained good cultures of *P. mexicana*, *P. cubensis* (as *Stropharia cubensis*), *P. aztecorum* var. *aztecorum*, *P. caerulescens* var. *caerulescens*, *P. caerulescens* var. *ombrophila* (as *P. mixaeensis*), *P. zapotecorum*, *P. muliercula* (as *P. wassonii*), *P. yungensis* (as *P. acutissima*), and *P. hoogshagenii* var. *hoogshagenii* (as *P. semperviva*). They observed sclerotia only in *P. mexicana*, but later observed in the wild condition by Guzmán (1978c) in *P. caerulescens* var. *caerulescens* and also were obtained in cultures of *P. tampanensis* (Guzmán & Pollock, 1978). Interesting is to observe that these three species with sclerotia belong to the Section *Mexicanae*. Production of sclerotia was observed also in *P. tampanensis* by Pollock (see discussion of *P. tampanensis*).

P. semperviva described by Heim & Cailleux (1958, and Heim & Wasson, 1958) as a mutant from cultures of *P. mexicana*, is synonymous with *P. hoogshagenii* var. *convexa* (Guzmán, 1978c), as will be discuss in *P. mexicana*.

Heim & Cailleux (in Heim & Wasson, 1958) and Kitamoto *et al.* (1975) studied some nutritional aspects in the fruit-body formation of *Psilocybe*, research very important in relation to the studies toward producing great amounts of fruit-bodies for industrial purposes.

Modern chemical studies in *Psilocybe* began with Hofmann in Sweden, who made the first chemical analysis in *P. mexicana*. He obtained cultures from Cailleux and Heim in Paris. However, the first chemical study of Mexican hallucinogenic mushrooms was made by Santesson in 1939 as was discussed above. Hofmann *et al.* (1958) isolated the indolic compounds: psilocybin and psilocin from *P. mexicana*; later (1959) they synthesized the psilocybin. These two substances were later found in other Mexican species of *Psilocybe* (Hofmann *et al.*, 1959; Ott & Guzmán, 1976), and in the North American species (*P. pelliculosa*, *P. baeocystis* and *P. stuntzii*)

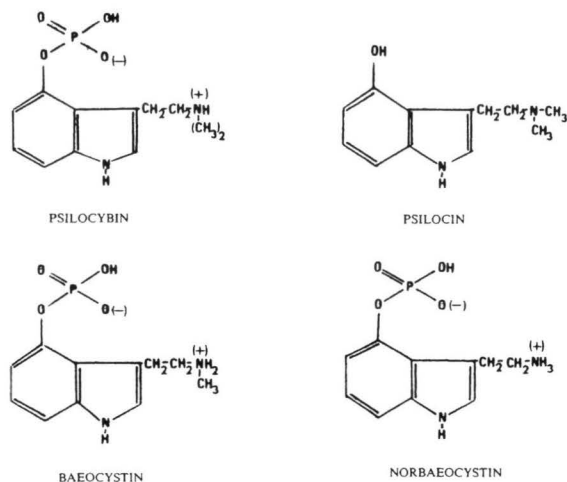


Plate 9: Hallucinogenic compounds in *Psilocybe* (see table 11).

(Benedict *et al.*, 1962; 1967; Ola'h & Heim, 1967), and in European species (*P. fime-taria* and *P. serbica*) (Benedict *et al.*, 1967; Moser & Horak, 1968; Smerdziewa & Nerud, 1973) as is show in table 11.

Baeocystin and nor-baeocystin are another indolic substances in hallucinogenic *Psilocybe*. They were first isolated from cultures of *P. beaeocystis* by Leung & Paul (1968), later found in other species, *e.g.*, in *P. semilanceata* (Repke & Leslie, 1977; Repke *et al.*, 1977a; Høiland, 1978). Table 11 lists of all species tested for psilocybin, baeocystin or nor-baeocystin by different authors. For further information on the chemistry of hallucinogenic *Psilocybe* see Schultes & Hofmann (1973). Hofmann (in Ott & Bigwood, 1978) presented a summary of these chemical investigations.

It is surprising in the table 11 to see that *P. caerulescens* var. *caerulescens*, that is a complex and one of the commonest and most widely distributed hallucinogenic mushrooms in Mexico, and also reported from Alabama (U.S.A.) and Panama and Venezuela (Guzmán, 1978a), has been studies chemically only one time by Heim & Wasson (1958). Other common species, such as *P. yungensis*, and *P. hoogshagenii* var. *hoogshagenii*, have never been studied chemically. Neither are there any chemical studies on the Japanese species, nor on tropical species. No species of the Section *Brunneocystidiatae* is known chemically. However, the Australian species, *P. subaeruginosa*, closely related to the species of Section *Brunneocystidiatae*, tests

positive for psilocybin (Picker & Rickards, 1970). One of first chemical works in Mexico on the hallucinogenic mushrooms is that made by Chávez de la Mora (1961), who studied *P. cubensis* and obtained psilocybin.

Those cases with a question-mark in table 11, mean that there is some confusion in the identification of the species, *e.g.*, *P. cyanescens* in the report of Benedict *et al.* (1962) is not so clear (see discussion of *P. cyanescens*). It is probable that some chemical reports on *P. cubensis* were really based on *P. subcubensis*, a closely related species. The chemical formulas of the psychotropic substances of the *Psilocybe* species: psilocybin, psilocin, baeocystin and nor-baeocystin, are show in plate 9.

Studies on steroid transformation activities of the hallucinogenic species of *Psilocybe*, mainly *P. caerulescens* have been made by Casas-Campillo group in Mexico (see Esparza-García, 1979; Gándara-Acosta, 1976; and Lazcano-Hernández, 1979). These authors even studied enzymatic activities from cells of *P. caerulescens* (Martínez-Mancilla, 1971).

Table 11. Hallucinogenic compounds in species of *Psilocybe*

<i>P. aztecum</i> var. <i>aztecum</i>	psilocybin	Heim & Wasson (1958) Heim & Hofmann (1958)
<i>P. aztecum</i> var. <i>bonetii</i>	psilocybin	Ott & Guzmán (1976)
<i>P. baeocystis</i>	baeocystin nor-baeocystin psilocybin	Benedict <i>et al.</i> (1962) Leung <i>et al.</i> (1965) Leung & Paul (1968) Repke <i>et al.</i> (1977a)
<i>P. caerulescens</i> var. <i>caerulescens</i>	psilocybin	Heim & Hofmann (1958)
<i>P. caerulipes</i>	psilocybin	Leung <i>et al.</i> (1965)
<i>P. callosa</i> ?	psilocybin	Leung <i>et al.</i> (1965) Benedict <i>et al.</i> (1967)

<i>P. cubensis</i>	baeocystin psilocybin psilocin	Heim & Hofmann (1958a, 1958b) Heim & Wasson (1958) Repke <i>et al.</i> (1977a) Repke <i>et al.</i> (1977b) Chávez de la Mora (1961)	<i>P. semilanceata</i> (see pag. 362)	baeocystin nor-baeocystin psilocybin	Hofmann <i>et al.</i> (1963) Benedict <i>et al.</i> (1967) Mantle & Waight (1969) Repke & Leslie (1977) Repke <i>et al.</i> (1977a) Høiland (1978)
<i>P. cyanescens?</i>	baeocystin psilocybin	Benedict <i>et al.</i> (1962) Repke <i>et al.</i> (1977a)	<i>P. serbica</i>	psilocybin	Moser & Horak (1968) Semerdzieva & Nerud (1973)
<i>P. cyanofibrillosa</i>	psilocybin psilocin	Beug & Bigwood (in Stamets <i>et al.</i> , 1980)	<i>P. silvatica</i>	baeocystin	Repke <i>et al.</i> (1977a)
<i>P. fimetaria</i>	psilocybin	Benedict <i>et al.</i> (1967)	<i>P. stuntzii</i>	baeocystin psilocybin psilocin	Guzmán & Ott (1976) Repke <i>et al.</i> (1977a)
<i>P. hoogshagenii</i> var. <i>convexa</i> (as <i>P. semperviva</i>)	psilocybin psilocin	Heim & Wasson (1958) Heim & Hofmann (1958a; 1958b)	<i>P. subaeruginosa</i>	psilocybin	Picker & Richards (1970)
<i>P. liniformans</i> var. <i>americana</i>	psilocybin	Beug & Bigwood (in Stamets <i>et al.</i> , 1980)	<i>P. zapotecorum</i>	psilocybin psilocin	Heim & Wasson (1958) Heim & Hofmann (1958a; 1958b) Ott & Guzmán (1976)
<i>P. mexicana</i>	psilocybin psilocin	Hofmann <i>et al.</i> (1958) Heim & Wasson (1958) Heim <i>et al.</i> (1958) Hofmann & Trowler (1959) Hofmann <i>et al.</i> (1959)			
<i>P. muliercula</i>	psilocybin psilocin	Heim & Wasson (1958)			
<i>P. pelliculosa</i>	baeocystin psilocybin	Tayler (1961) Repke <i>et al.</i> (1977a)			
<i>P. quebecensis</i>	psilocybin	Ola'h & Heim (1967)			

4. Importance and Problems of the Hallucinogenic Mushrooms

In addition to the great ethnological importance of the hallucinogenic mushrooms, they are also important in medicine, mainly in neuropsychiatric research. They are useful in researches studying the mind, to learn how many complex it is. Indians use mushrooms to "see the future", to "guess the future", to "talk with their dead relatives", or to "talk with God". The physicians and scientists are very interested in these mushrooms because, if these mushrooms are eaten in a reasonably amounts, they can be used in the research of the mind. The Indians recommend eating around 6-12 mushrooms; in Huautla de Jiménez, for instance, they eat only 12 (or six pairs, as they say). Ingesting more than 20 mushrooms is generally considered to be very dangerous. The effect of ingestion of hallucinogenic species of *Psilocybe* and of pure psilocybin is very common to find in the bibliography for a number of personal accounts by scientist and other observers. Rumack & Salzman (1978) stated that the effects vary according to (a) the circumstances where the people eat the mushrooms, (b) the number of experiences, (c) the individual psychological make up and cultural background of the people, (d) the quantity of psilocybin ingested, and (e) the preparations (if any) of the mushrooms. If the mushrooms are dry, the doses need to increase more than 20 specimens.

The impact of the research conducted with hallucinogenic mushrooms, including *Amanita muscaria*, and *Clavipes purpurea*, as stated Rumack & Salzman (1978), has revolutionized the psychiatry, introducing more chemotherapy field and is hoped to lead eventually to a control of mental diseases or at least some stages of schizophrenia.

The hallucinogenic indolic principles (mainly psilocybin) seem to act as an antimitabolite for the serotonin in the human brain. Serotonin seems to keep the nervous system in normal stage, but if psilocybin is substituted for it an abnormal but transitory stage with hallucinations occurs. It is then that a neuropsychiatric can learn of the look problems or complexes in the subject as was discussed by Carvajal (1959) and Cerletti (1959, 1961). Carvajal made some important prognostications on the future use of these fungi in neuropsychiatric research. Heimann (1961) presented an interesting research on the effects of the psilocybin in psychiatry.

Unfortunately the publicity on the action of psilocybin and hallucinogenic mushrooms has led to their fall in an excessive use of these among young people. Hallucinogenic drugs use is now very common in our modern world, mainly among students. These drugs and the fungi are now classified as controlled substances in U.S.A. and Mexico. This proscription slows medical and scientific research on hallucinogenic mushrooms. Nieto (1959) reported that the ingestion of *P. cubensis* among 20 normal subjects caused intoxication very like to that seen during mescaline or LSD intoxications. Heim & Wasson (1958) and Singer *et al.* (1958) presented some very interesting aspects on the use of the hallucinogenic mushrooms to the medicine. Weil (1977) presented an account on the use of hallucinogenic fungi in U.S.A.

5. Common Names of the hallucinogenic species

As the hallucinogenic mushrooms are very important among several indigenous tribes of Mexico for religious ceremonies, they receive many popular names. Some of these names are in Indian languages and others are in Spanish as a result of the Christian religious influences.

"Teonanácatl" and "nanácatl" were the first names reported for these fungi in Mexico by Sahagún (1955) in the sixteenth century. The word "nanácatl" (in Nahuatl language) means meat and was and is used by the Mexican Indians for all kinds of the mushrooms, edible or poisonous. But the word "teonanácatl", means sacred mushroom, wondrous mushroom or divine meat and was used for the hallucinogenic mushrooms, but is not used any more. However, the Nahuatl Indians use in Necaxa region (State of Puebla, at Mexico) the name "teotlaquilnanácatl" for *P. mexicana*, *P. hoogshagenii* var. *convexa*, *P. caerulescens* var. *caerulescens*, and sometimes for *P. cubensis*. This interesting word that is closely to "teonanácatl" was reported by Guzmán (1960) and means "the sacred mushroom that describes or draws in color"; from the Nahuatl "tlaquil", that means painting or drawing with color, and "nanácatl", mushroom.

Table 12 list all the common names of the hallucinogenic mushrooms which the author found in use among the Mexican Indians and in the foreign countries. Some of them are taken from the bibliography (Sahagún, 1955; Schultes, 1940; Reko, 1945; 1949; Heim & Wasson, 1958; Heim *et al.*, 1967; Miller, 1966; and Lipp 1971). Martínéz (1979) presented a summary of the most important Mexican names of the hallucinogenic mushrooms. It is interesting to observe that of the total of 149 names, only 14 are use outside of Mexico. From Central America, only the name "suntiamá" was found by the author in La Mosquitia, Honduras, in 1956 for *P. subcubensis*. The only English name known to the author, "liberty caps", is applied to *P. semilanceata* in the Pacific Northwest of North America and England. But Ott & Bigwood (1978) reported the common names: "knobbly top" for *P. baeocystis*, "blue halo" and "wavy cap" for *P. cyanescens*, "sandy sagerose" for *P. semilanceata*, "blue veil" for *P. stuntzii*, and "golden top" and "purple ring" for *P. cubensis*. Heim (in Heim *et al.*, 1967) reported the name "koull-tourroum" for *P. kumaenorum* in New Guinea. Recently, Ruck *et al.* in 1979 (see a note in Wasson, 1980, pag. XIV) considered the hallucinogenic mushrooms with the new name of *entheogens*, from the Greek "God within us".*

It is interesting to note about the popular Mexican names that *P. mexicana*, *P. caerulescens* var. *caerulescens* and *P. zapotecorum*, which are common through the subtropic regions of the country, have the majority of the popular names. But *P. cubensis* and *P. subcubensis*, which are even more very common, than the others, have only Spanish names, e.g., "San Isidro" or "San Isidro Labrador". These are because *P. cubensis* and *P. subcubensis* were introduced to America by the Spanish conquest, through the cattle brought from Africa.

*See also the note in the reference Wasson *et al.* (1978).

Table 12. Popular names of the hallucinogenic *Psilocybe* species in Mexico and other countries

amokia (Mije, Mexico)	<i>P. mexicana</i>
a-mokya (Chinantec, Mexico)	<i>P. mexicana</i>
a-mo-kid (see above)	
angelito (Spanish, = little saint, Mexico)	<i>P. mexicana</i>
a-ni (Chinantec, Mexico)	<i>P. mexicana</i>
apipiltzin (Nahuatl, Mexico)	<i>P. aztecum</i> var. <i>aztecum</i> , <i>P. aztecum</i> var. <i>bonetii</i>
atka-t (Mije, = Mayor, Mexico)	<i>P. cordispora</i> , <i>P. caerulea</i> var. <i>ombrophila</i> , <i>P. mexicana</i> , <i>P. yungensis</i>
at-kat (Mije, = Mayor, Mexico)	<i>P. cordispora</i> , <i>P. caerulea</i> var. <i>ombrophila</i> , <i>P. mexicana</i> , <i>P. yungensis</i>
badao zoo (Zapotec, Mexico)	<i>P. zapotecorum</i>
badoo (Zapotec, Mexico)	<i>P. zapotecorum</i>
bei (Zapotec, Mexico)	<i>P. zapotecorum</i>
be-meeche (Zapotec, Mexico)	<i>P. zapotecorum</i>
beya-zoo (Zapotec, Mexico)	<i>P. zapotecorum</i>
beyo-zoo (see above)	
bi-neeche (Zapotec, Mexico)	<i>P. zapotecorum</i>
bi-niich (see below)	
bi-niichi (Zapotec, Mexico)	probably <i>P. zapotecorum</i>
blue halo (English, U.S.A.)	<i>P. cyanescens</i>
blue veil (English, U.S.A.)	<i>P. stuntzii</i>
cañadas (Spanish = ravines, Mexico)	<i>P. caerulea</i> var. <i>caerulea</i> , <i>P. zapotecorum</i>
cauigua-terékua (Purepecha, = mushrooms to get drunk, Mexico)	some unknown hallucinogenic species in Michoacan, probable
chamaquillos (Spanish, = little boys, Mexico)	<i>P. mexicana</i> or others
cihuatsinsintle (Nahuatl, Mexico)	<i>P. hoogshagenii</i> var. <i>hoogshagenii</i> and other species
	<i>P. muliercula</i>
corona de cristo (Spanish, Mexico)	<i>P. zapotecorum</i>

cositas (Spanish, = little things, Mexico)

cui-jajo-o-ki (Chatin, Mexico)
cui-ya-jo-o-so (see below)
cui-ya-jo-o-su (Chatin, Mexico)
cui-ya-jo-to-ki (see cui-jajo-o-ki)
cui-ya-jo-o-tno (Chatin, = large sacred mushroom, Mexico)
cui-ya-jo-otnu (see above)
cui-ya-jo-to-ki (Chatin, Mexico)
cuir-ya-jo-oki (see above)
derrumbes (Spanish, = landslide, Mexico)
derrumbe de agua (Spanish, landslide in the water, Mexico)
derrumbe del estiércol de vaca (Spanish, = landslide that grows on cow dung, Mexico)
derrumbe negro (Spanish, = black landslide, Mexico)
di-chi-te-ki-sho (see below)
di-chi-to-nize (see di-shi-tho-nize)
di-ki-sho (or 'nti xi tho) (Mazatec, = the dear little things that leap forth, Mexico)
di-ki-sho le rra-ja (see di-shi-tho-le-rraja)
di-nezé-ta-a-ya (Mazatec, Mexico)
di-nizé (Mazatec, = little bird, Mexico)
di-nize taa-ya (Mazatec, Mexico)
di-nizé-te-aya (see above)
di-shi-tho-ki-shó (Mazatepec, Mexico)
di-shi-tho-le-nraja (Mazatec, = the fungus like those grow on cow dung, Mexico)

all the hallucinogenic mushrooms in Huautla de Jiménez region

<i>P. mexicana</i>
<i>P. caerulea</i> var. <i>ombrophila</i>
<i>P. zapotecorum</i>
<i>P. mexicana</i>
<i>P. caerulea</i> var. <i>caerulea</i> , <i>P. zapotecorum</i>
<i>P. caerulea</i> var. <i>caerulea</i> , <i>P. zapotecorum</i>
<i>P. cubensis</i> , <i>P. subcubensis</i>
<i>P. caerulea</i> var. <i>ombrophila</i> , <i>P. cordispora</i> , <i>P. heimii</i> , <i>P. yungensis</i> , <i>P. zapotecorum</i>
all the hallucinogenic mushrooms in Huautla de Jiménez region, mainly <i>P. caerulea</i> var. <i>caerulea</i>
<i>P. yungensis</i>
<i>P. mexicana</i>
<i>P. zapotecorum</i> , <i>P. yungensis</i> , <i>P. hoogshagenii</i> var. <i>hoogshagenii</i>

P. caerulea var. *caerulea*
P. cubensis, *P. subcubensis*

di-shi-tho-nize (mazatec, Mexico)	<i>P. mexicana</i>	knobbly top (English, U.S.A.)	<i>P. baeocystis</i>
di-shi-tjo-leta-ja (Mazatec, Mexico)	<i>P. yungensis</i>	koull-torroum (Kuma Indians, New Guinea)	<i>P. kumaenorum</i>
di-shi-to-ta-a-ya (see above)	<i>P. yungensis</i>	liberty caps (English, Canada, U.S.A., England)	<i>P. semilanceata</i>
dormilon (Spanish, = sleepy head)	<i>P. aztecorum</i> (both varieties)	ma-nadje-zuhe (Chinantec, Mexico)	<i>P. mexicana</i>
dulces clavitos del Señor (Spanish, Mexico)	<i>P. cordispora</i>	mbey-sant (Zapotec, = saint mushroom, Mexico)	<i>P. zapotecorum</i> , <i>P. mexicana</i>
entheogens (Latin, = God within us, name proposed by Ruck <i>et al.</i> (1979, see note in the reference Wasson <i>et al.</i> , 1978)	all the hallucinogenic plants	mujercitas (Spanish, = little woman, Mexico)	<i>P. muliercula</i>
golden top (English, U.S.A.)	<i>P. cubensis</i>	nano-catsintli (Nahuatl, Mexico)	<i>P. muliercula</i>
hjure-he (see reje)		nañ-tauga (Chinantec, Mexico)	probably <i>P. mexicana</i>
hongo adivinador (Spanish, = divinatory mushroom, Mexico)	<i>P. yungensis</i> and other species	nashwinmush (Mije, Mexico)	<i>P. cordispora</i> , <i>P. caeruleascens</i> var. <i>ombrophila</i> , <i>P. mexicana</i>
hongo de la razón (Spanish, Mexico)	<i>P. zapotecorum</i>	nche-je (Mazatec, Mexico)	<i>P. zapotecorum</i>
hongo genio (Spanish = genius mushroom, Mexico)	<i>P. yungensis</i>	ndi-ki-sho (see di-ki-sho)	
hongo malo que emborracha (Spanish, = envil mushroom that embriate, Mexico)	several hallucinogenic mushrooms.	ndi-shi-tjo-ni-se (Mazatec, Mexico)	<i>P. mexicana</i>
hongo que emborracha (Spanish, = mushrooms to get drunk, Mexico)	several species of <i>Psilocybe</i>	netochhuatata (Nahuatl, Mexico)	probably <i>P. muliercula</i>
hongo que adormece (Spanish = soporific mushroom) Mexico)	<i>P. yungensis</i>	neurotropics	name to call the hallucinogenic plants, including the mushrooms
hongo sagrado (Spanish, Mexico)	several species of <i>Psilocybe</i>	niñas (Spanish, = girls, Mexico)	<i>P. muliercula</i>
hongo santo de las praderas (Spanish, Mexico)	<i>P. mexicana</i>	niñitos (Spanish, Mexico)	<i>P. aztecorum</i> (both varieties)
honguito (Spanish, = little mushroom, Mexico)	several sacred mushrooms	niño (Spanish, = boys, Mexico)	<i>P. muliercula</i> , <i>P. aztecorum</i> (both varieties)
honguito adivinador (Spanish, = little diviner mushroom, Mexico)	<i>P. zapotecorum</i> and other species probably <i>P. zapotecorum</i>	niño santo (Spanish, = little boy Mexico)	all the hallucinogenic mushrooms in Huautla de Jiménez region
ja-nünó (Zapotec, Mexico)		nize (Mazatec, = little bird, Mexico)	<i>P. mexicana</i>
ki-sho (see di-ki-sho)		nocuana-be-neeche (see below)	probably <i>P. zapotecorum</i> , or <i>P. cubensis</i> or <i>P. subcubensis</i>
kee sho (see she to)	<i>P. caeruleascens</i> var. <i>ombrophila</i> (= <i>P. mixaeensis</i>), <i>P. mexicana</i>	nocuana-be-neecho (Zapotec, Mexico)	<i>P. caeruleascens</i> var. <i>caeruleascens</i>
kong (Mije, Mexico)		nti-si-tho kiso (Mazatec, Mexico)	<i>P. mexicana</i>
kongk (see kong)		nti-sitho-nizé (Mazatec, Mexico)	<i>P. yungensis</i>
konk (see kong)		nti-si-tho-taaya (Mazatec, Mexico)	<i>P. cubensis</i> , <i>P. subcubensis</i>
ko-nk (see kong)		nti-si-tho-yele-nraha (Mazatec, Mexico)	<i>P. cubensis</i> and probably <i>P. subcubensis</i>
		nti-xi-tjole-ncha-ja (Mazatec, Mexico)	<i>P. mexicana</i>
		pajarito (Spanish, = little bird, Mexico)	

pajarito de monte (Spanish, = little bird of forest, Mexico)
 patao-zoo (Zapotec, Mexico)
 paya-zoo (Zapotec, Mexico)
 pea-cho (Zapotec, Mexico)
 pe-neeche (Zapotec, Mexico)
 pea-zoo (Zapotec, Mexico)
 pequeños que brotan (Spanish, = little ones that leap forth, Mexico)
 peya-zoo (see pea-zoo)
 piit-pa (Mije, Mexico)
 pi-neeche (Zapotec, Mexico)
 pi-nijchi (see above)
 pi-tpa (see above)
 pi-tpi (Mije, Mexico)
 pi-nij-chi (Zapotec, Mexico)
 piule de barda (Zapotec, = mushroom of the Christ crow of spines, Mexico)
 piule de churis (Zapotec, Mexico)
 psychedelics
 psychotomimetics
 psychotropics
 purple ring (English, U.S.A.)
 quauhtan-nanácatl (Nahuatl, Mexico)
 razón-bei (see below)
 razón-guiol (Zapotec, Mexico)
 razón mbey (Zapotec, Mexico)
 razón-mbei (see razón mbey)
 razón viejo (Spanish, Mexico)
 reje (Mazatec, = where other mushrooms will grow, Mexico)

P. yungensis, *P. heimii*
P. zapotecorum
P. zapotecorum
P. zapotecorum
 probably *P. zapotecorum*
P. zapotecorum
 all the hallucinogenic mushrooms in Huautla de Jiménez region

P. mexicana, *P. yungensis*
 probably *P. zapotecorum*

P. mexicana, *P. cordispora*
P. zapotecorum
P. zapotecorum

P. zapotecorum, *P. mexicana*
 name to call the hallucinogenic plants, including the mushrooms
 name to call all the hallucinogenic plants, including the mushrooms
 name to call all the hallucinogenic plants, including the mushrooms
P. cubensis
 probably *P. muliercula*
P. zapotecorum, *P. caerulescens* var. *caerulescens*
P. zapotecorum
P. zapotecorum, *P. caerulescens* var. *caerulescens*

P. zapotecorum
P. zapotecorum

sacred (Spanish, Mexico)
 San Isidro (see below)
 San Isidro Labrador (Spanish, = a Spanish Saint, Mexico)*
 sandy sagerose (English, U.S.A.)
 santitos (Spanish, = little saints, Mexico)
 señores principales (Spanish, Mexico)
 she-to (see di-ki-sho)
 si-tho (Mazatec Mexico)
 siwatsitsintli (Nahuatl, Mexico)
 steyi (Mazatec, Mexico)
 suntiama (Spanish, Honduras)
 teonanácatl (Nahuatl, = divine mushroom, Mexico)
 teotlaquilnanácatl (Nahuatl, = divine mushrooms that describe or paint, Mexico)
 teu-nanácatl (Nahuatl, Mexico)
 tejuinti (Nahuatl, Mexico)
 teyhuinti nanácatl (Nahuatl, Mexico)
 thain (Mazatec, Mexico)

 t-ha-na-sa (Mazatec, Mexico)
 to-shka (Mazatec, Mexico)
 tsmay-ye (Mazatec, Mexico)
 tsamikindi (Mazatec, Mexico)
 wavy cap (English, U.S.A.)
 zoo-patao (Zapotec, Mexico)

hallucinogenic mushrooms

P. cubensis, *P. subcubensis*

P. semilanceata
P. muliercula

P. fagicola

P. mexicana
P. muliercula
 probably *P. mexicana*
P. subcubensis
 not used in modern times, maybe was used for *P. aztecum*
P. caerulescens var. *caerulescens*
P. mexicana, *P. hoogshagenii* var. *convexa*
 probably *P. aztecum*
 probably *P. aztecum*
 probably *P. aztecum*
 embraces the whole mushrooms in the Mazatec region, including edible, poisonous and innocuous species, except the hallucinogenic or sacred species (see di-ki-sho)
 probably *P. mexicana*
 probably *P. mexicana*
 probably *P. mexicana*
 probably *P. mexicana*
 probably *P. cyanescens*
 probably *P. zapotecum*

*Saint of the agriculture

TAXONOMY OF *PSILOCYBE*

1. Description of the genus

Psilocybe (Fr.) Kummer, *Führ. Pilzk.*, p. 21, 1871.

Type species: *Agaricus montanus* Pers. ex Fr., *Syst. Myc.*, p. 293, 1821.

Agaricus, Sect. *Coprinus* Pers., *Synop. Meth. Fung.*, p. 407, 1801, *pro parte*.

Agaricus, tribus *Psilocybe* Fr., *Syst. Myc. I*, p. 289, 1821.

Agaricus subgen. *Psilocybe* (Fr.) Loud, *Encycl. pl.* 1004, 1829.

Agaricus subgen. *Deconica* W.G. Smith, *Clavis Agaric.*, p. 23, 1870.

Psilocybe (Fr.) Quél., *Champ. Jura Vosg.*, p. 147, 1872-3, non Fayod, *Ann. Sc. Nat. Bot. VII* 9: 377, 1889 (= *Panaeolina* Maire).

Deconica (W.G. Smith) Karst., *Bidr. Finl. Nat. Folk* 32: XXVI, 515, 1879.

Pholiotella Speg., *Bol. Acad. Cienc. Cordoba* 11: 412, 1889.

Delitescor Earle, *Bull. N. Y. Gard.* 5: 434, 1909.

Psilocybe, in Rick, *Brotéria (Ser. Bot.)* 18: 62, 1920.

Deconia, in Beck, *Pilzk. u. Kräutertf.* 5: 189, 1922 (this is apparently an unintentional error in spelling).

Pileus semiglobate to conic or convex then campanulate, often umbonate or papillate, rarely becoming plane and depressed in age, viscid, subviscid, lubricous or rarely dry, frequently hygrophanous, glabrous not scaly or if scaly, the scales are from remnants of the veil, floccose and evanescent, surface even or slightly striate, brownish or yellowish, fading to light or dark tones. Lamellae adnexed to adnate, or sinuate-adnexed, brownish, gray violet, yellowish violaceous, brownish violaceous, chocolate brown or purple brown, sometimes mottled, often with a pallid edge and subfloccose. Stipe central, cylindric, equal or thickened at the base, slender to fairly robust, not viscid, usually hollow to stuffed, white, whitish, yellowish or brownish, or concolours with the pileus, smooth, or floccose-fibrillose; sometimes with a pseudorhiza or with rhizoids. Veil varying from weakly developed and cortinate, leaving rudimentary and floccose and fugacious fibrils, to strongly developed forming a membranous more or less permanent annulus. Context whitish or brownish, fleshy in the pileus and stipe or fibrillose or cartilaginous in the stipe, sometimes bluing (or the surface of pileus and stipe bluing when touched or bruised) in some species (the hallucinogenic fungi). Spore print dark violet brownish, dark violaceous gray, purple fuscous, purplish brown or deep lilac.

Spores dark or light yellowish brown or melleous-brown mounted in KOH solution, ellipsoid or subellipsoid both in face and side view, or rhomboid, subrhomboid, or subhexagonal in face view, small (4.5-6 μm long) to large (12-14 or 16-22 μm long), thin or thick walled, smooth with a broad apical germ pore causing the apex to appear truncate. Basidia typically 4-spored, but sometimes 1-, 2-, or 3-spored, hyaline, rarely yellowish or pale brownish, ventricose or subcylindric, usually with a median or more superior constriction. Pleurocystidia present or absent, but if present hyaline, or brown, or brownish, or chocolate-brownish, but without any amorphous hyaline or yellow inclosure. Cheilocystidia usually present, hyaline or rarely brown or brownish, usually abundant, causing the edge of the gill to be completely sterile. Subhymenium well developed, hyaline or yellowish brown, with or without incrustated brown, orangish-brown or yellowish brown pigment on the walls. Hymenophoral trama regular or subregular, the hyphal tending to become interwoven and irregular in size. Epicutis of pileus consisting of a hyaline to rather gelatinous pellicle, formed by filamentous repent thin-walled hyphae; sometimes it is possible peels or remove a pellicle. Hypodermium of interwoven broader hyphae, elongated to inflated or strictly subcellular, hyaline or yellowish brown, generally incrustated on the walls. Lactiferous hyphae sometimes present. Clamp connections present.

2. Observations and intergeneric relationships of the genus

Referring to the type species of the genus *Psilocybe*, six species have been proposed or indicated by different mycologists. When Kummer (1871) introduced the generic name, no type species was indicated. Karsten in 1879 proposed the genus *Deconica* (the subgenus *Deconica* W.G. Smith 1870 of the genus *Psilocybe*), which removed the most typical species of *Psilocybe*. Donk (1962) presented a complete review of this matter which, because of its importance in the typification, it is present here:

“(i) *Agaricus cernuus* Vahl per Fr., indicated by Earle (1909: 393, 421) for *Psilocybe* (Fr.) “Quél.” it being the first species of Quélet to whom the generic name was ascribed. Not an original species (1821), but placed by Fries in ‘*Psathyra*’, and when Fries (1838) admitted in ‘*Psilocybe*’ he remarked about it “*Transit ad Psathyras...*” Moreover, Kummer retained it in *Psathyra* (Fr.) Kumm.”

“(ii) Clements & Shear (1931: 350) suggested *Agaricus merdarius* Fr. for the generic name *Psilocybe* “Fr.” An original species (1821), but soon excluded by Fries himself, first to ‘*Psalliota*’ and afterwards to ‘*Stropharia*’. Not included by Kummer. Acceptance would make *Psilocybe* to many mycologists a synonym of *Stropharia* (Fr.) Quél. However, the species has been re-included in *Psilocybe* by some authors”.

“(iii) *Agaricus semilanceatus* Fr. per Secr. was selected by Singer (1936: 340) for the generic name *Psilocybe* “Fr.”, and by Singer & Smith (1946: 245, 265; as ‘*Agaricus semilanceatus* Fr. Monogr.’) and Singer (1951a: 504) for *Psilocybe* (Fr.) “Quél.” It is not acceptable, in my opinion, since Fries treated it in 1821 as a synonym of one of the many forms of *A. callosus*; in 1838 it is Fries’ very last member of the tribus and the characters by which it could be separated from ‘*Galera*’ were emphasized, which is significant. Hardly a typical species from Fries’s point of view of 1821, who included it in the ‘*Rigidi*’ in 1838. Singer & Smith made this selection, they stated, to save the Friesian name *Psilocybe*. Actually they wanted to save the later name *Deconica*, given to what might well be the most typical group of ‘*Psilocybe*’ and a segregate not authorized by Fries himself. Recently Singer (1951b: 215) selected the same species for *Psilocybe* Kumm. (Kummer called it *P. “semilanceolatus”*).’

“(iv) *Agaricus foenisecii* Pers. per Fr. was selected by Imai (1938: 287) for *Psilocybe* (Fr.) “Quél.” Although an original species, it was in 1821 included in the ‘*Rigidi*’ and annotated “*Non ex grege naturali praec., sed e A. papilionacei*”. It is indeed rather closely related to the latter, the type species of *Panaeolus* (Fr.) Quél., q.v., and constitutes the type species of *Panaeolina* Maire (1933). It is not mentioned by Kummer”.

“(v) *Agaricus sarcocephalus* Fr. per Fr. was mentioned as type species by Maublanc (Champ. comest. vén., 3e Ed., 1: cvii. 1938) for *Psilocybe* (Fr.) “Quél. emend.” (It is apparently to be taken in Fries’ sense of 1857). Attention may be drawn to the fact that Fries, although regarding it as a very striking fungus, stated that it was not

related to any of the other species of the tribus. It belongs rather to *Psathyrella* emend. Kühner, although Fries (1857, 1874) included it in the '*Tenaces*'. Not mentioned by Kummer''.

“(vi) Donk (1949b: 341-347) tentatively suggested *Agaricus montanus*. It is an original species (in 1821 including *A. atrorufus* Schaeff. per Fr. as a variety); it belongs to the '*Tenaces*'; and it is one of Kummer's species. A drawback is that it was perhaps not as prominent a member of the tribus when the latter was introduced as some others were. Its acceptance would make *Psilocybe* in the strictest sense the legitimate name for *Deconica*'.

Following Donk's opinion (1962) *P. montana* is recognized as the type species of the genus *Psilocybe*. It meets all the requirements. However some modern authors, as Singer (1962) and Horak (1968) considered *P. semilanceata* as the type species, and other authors maintain *Deconica* as independent genus.

Deconica is a synonym of *Psilocybe*. The lentiform or rhomboid spores and little fruit bodies were considered good features to separate *Deconica* from *Psilocybe*, but many European and American species of *Psilocybe* have features that situated these species as intermediate between *Psilocybe* and *Deconica*, and the delimitation between both genera is impossible. Pegler & Young (1971) observed that the distinction between *Psilocybe* and *Deconica* is not strongly defined and a series of intermediate species tends to favor the view that only a single genus is involved.

Psilocybe has been generally ascribed to Quélet (1872) but it was Kummer (1871) who recognized *Psilocybe* separate from the Friesian tribus, as Donk (1962) pointed out.

The development of the fruit-body in *Psilocybe* is hemiangiocarpous (bivelangiocarpous or monovelangiocarpous), according to Singer (1975) who accepted Reijnders' studies (1963). *P. mexicana*, *P. coprophila*, *P. cubensis* and *P. crobula* have bivelangiocarpous, and *P. hoogshagenii* var. *convexa* (reported as *P. semper-viva*), *P. zapotecorum*, and also *P. mexicana* have monovelangiocarpous development. Watling (1971) studied the development of the fruit-body of *P. merdaria* and observed an interesting polymorphism. Apart from normal fruit-bodies he recognized a series of forms ranging from laterally stipitate to gasteromycetoid. The shape of the basidium was variable and several derivations from the typical basidium are described. Watling suggested that the origin of at least some types of pleurocystidia should be sought in modifications of the basidium. The same observations have been made by Guzmán in several species here studied.

McKnight (1953, 1971) obtained cultures of *P. coprophila*, observing a strong variation in the development of the fruit body. He obtained agaricoid, poroid, and gastroid fruit bodies that were all fertile from cow manure from Idaho (U.S.A.). The pattern of tetrapolar sexuality was modified by high frequencies of secondary homothallism, as later stated Cooke (1979). Macnight (1971) described a new species of *Psilocybe*, that he call *P. mutans*, but as will be discuss later, this is a synonym of *P. coprophila*.

The cultural variation found by Watling and McKnight above discussed, help to understand better the phylogenetic relationship of *Psilocybe*. The presence of the gasteromycetoid forms are very important in the study of the evolution of the Agaricales, and connects *Psilocybe* with *Weraroa* Sing., a Secotiaceae fungus that Singer (1958c) considered as a probable ancestor of *Psilocybe*. The bluish green reaction in this ancestor, made interesting relationships with Section *Brunneocystidiatae* Guzmán of *Psilocybe*, as will be discuss later.

For addition information on the gasteromycetoid forms found in *Psilocybe*, see also Clemençon (1977, pages 138, 253, and 254), where Smith, Watling and Singer made interesting observations. A species of *Psilocybe* occurring on rabbit and horse dung on Stokholm Islands studied by Parker-Rhodes, was intermediate between two previously well-known species. By statial analysis of spores tetrads from hybrid and its suspected parents, it was thought that the new hybrid had become stabilized in recent time and that it is a distinct genetic entity, although capable of back crossing to the parent species (Cooke, 1979).

Related as to the number of the species described in the genus *Psilocybe*, it is interesting to see the great diversity as indicated by the bibliography. Fries (1821-1832) described 26 species and varieties. Saccardo (1882-1931) listed more than 200 taxa and Singer (1962) treated more than 50 taxa. Later Singer (1975) reported about 84 species and varieties. Guzmán & Vergeer (1978) listed 390 taxa, of which they excluded 210, since they belong to different genera, or are synonyms, or are doubtful species, or are *nomina nuda*. In this monograph the number of the taxa in *Psilocybe* is increased to 467, of which, 144 species and varieties are considered valid, 90 are synonyms, 119 are doubtful taxa, and 114 are excluded.

Psilocybe belongs to the tribus *Stropharioideae* Sing. of the Family *Strophariaceae* Sing. & Smith (following Singer, 1975). The other genera of the tribus are *Naematoloma*, *Stropharia* and *Melanotus*, which are easy to separate from *Psilocybe* according to the presence or absence of chrysocystidia and the structure of the pileus (Guzmán, 1980). *Naematoloma* and *Stropharia* have chrysocystidia, but *Psilocybe* and *Melanotus* never have them. *Naematoloma* has a subcellular hypodermium. *Stropharia* has a hypodermium of elongated hyphae. *Psilocybe* and *Melanotus* are easy to separate one from the other, by the central and long stipe in *Psilocybe* and short or poorly developes and excentric stipe (shorter than the diameter of the pileus) in *Melanotus*.

Tribus *Stropharioideae* and Tribus *Pholiotoideae* of the Family *Strophariaceae* differ mainly by the color of the spores and the spore print. In the *Pholiotoideae* the spores are yellowish, orangish yellow, or yellowish brown, and the spore print frequently has a distinct rusty tone, or cinnamon brown, or rusty to fuscous color.

Smith & Hesler (1968) pointed out the relationships between *Pholiota*. They wrote: "One of the major problems still to be resolved in relation to *Pholiota* and *Geophila* group of genera (*Psilocybe*, *Naematoloma* and *Stropharia*) demands critical observations on the color of the spore deposits, since this is at present the only major distinction between the two groups". Singer (1975) noted that *Psilocybe* and *Pholiota* differ principally in the color of the spore print.

Psathyrella, *Panaeolus*, and *Agrocybe* are frequently confused with *Psilocybe* because of the habit and the color of their lamellae. However it is easy to separate these three genera by the color of their spores in the first two genera and the structure of the pileus in the latter genus. *Psathyrella* has gray violet spores, and *Panaeolus* blackish brown spores. Many species of *Psathyrella* and *Panaeolus foenisecii* (Pers. ex Fr.) Kühn. have warty or verrucose spores. *Agrocybe*, has smooth spores and as in all the members of the *Bolbitiaceae*, has a hymeniform pileus.

Kuehneromyces Singer & Smith (1946b) is another genus closely related to *Psilocybe* in the color of its lamellae and habit, but the color of its spores, as well as the ornamentation of the wall (as seen in electron microscopy, Pegler & Young, 1971, in *K. mutabilis* (Schaeff. ex Fr.) Sing. & Smith), distinguishes it from *Psilocybe*. Singer & Smith (1946) separated *Kuehneromyces* from *Psilocybe* on spores color. Smith & Hesler (1968) considered *Kuehneromyces* as synonym of *Pholiota*.

Geophila Quél. and *Dryophila* Quél. (Quélet, 1872) represent the combination of the genera *Stropharia*, *Naematoloma* (or *Hypholoma*), and *Psilocybe*. These genera were accepted by many European mycologists (Kühner & Romagnesi, 1953) and some American mycologist (Smith, 1971). They were accepted because it was useful to have all the members of the Subfamily Stropharioideae in one genus. However, if we take in consideration the large number of species in the three genera and the features presently use to separate them, it is more convenient to consider *Geophila* or *Dryophila* as not accepted genus (*Geophila* Quél. has the homonym *Geophila* D. Don, 1825, Fam. *Rubiaceae*). Smith (1949) pointed out (pag. 516) that *Psilocybe*, *Naematoloma* and *Stropharia* form a triangle with each genus placed at one of the angles. Recently (Smith, 1979) has recognized *Psilocybe sensu lato* to include *Psilocybe sensu stricto*, *Naematoloma*, and *Stropharia* in one genus, because to separate these genera only on their cystidia is not taxonomically valid. He claimed that if it is possible to find species with both chrysocystidia and hyaline pleurocystidia (leptocystidia), as occurs in *Stropharia hornmanii* (Fr.) Lundell & Nanfeldt, then it is impossible to separate the three genera. This position is not followed in the present monograph, for it is considered that the presence or absence of chrysocystidia is a good taxonomic character to separate *Stropharia* and *Naematoloma* from *Psilocybe* (Guzmán, 1980). Smith (1979) only recognised *Psilocybe* and *Pholiota* in the family *Strophariaceae*.

What can the chemical studies on the hallucinogenic species tell us about the relationships of *Psilocybe*? What does it mean when psilocybin is found in other genera such *Conocybe* and *Panaeolus*? Psilocybin has been reported in *Conocybe smithii* Watling and *C. cyanopus* (Atk.) Kühn. (Benedict *et al.*, 1962, 1967). Ola'h (1969) reported psilocybin in *Panaeolus subbalteatus* (B. & Br.) Sacc., and Heim & Hofmann (1958a) reported it in *P. sphinctrinus* (Fr.) Quél. It seems that there are some problems in the chemical analysis of *Panaeolus* (see Tyler in Petersen, 1971); it seems that *Panaeolus* does not have psilocybin but rather serotonin, substance closely related to psilocybin. Tyler (*op. cit.*) stated that "the occurrence (-of psilocybin in both *Psilocybe* and *Conocybe*-) must either be accepted as an indication

that certain species of *Conocybe* and *Psilocybe* are more closely related than previously believed, or it is a remarkable example of the convergence of biochemical characteristics". It is very probably that Tyler's second suggestion is the most likely because *Conocybe* in fact is a genus very distant from *Psilocybe*. The color of its spores, the structure of its pileus, and the form of its cystidia are very different. The same is true for *Panaeolus*.

It is necessary to be very careful when interpreting chemical information into taxonomy. In the opinion of the author, there is not sufficient information on the chemistry of *Psilocybe* and "related genera" to find phylogenetic relationships. Kühner (1978; 1979) discusses ontogeny, and phylogeny of the Fam. *Strophariaceae* including the genus *Psilocybe*. He also studied certain aspects on the biochemistry of the mycelium of different species.

3. Classification of the genus

Fries (1821-1832) divided *Psilocybe* into two groups: "Lamellae adnatae" (p. 289) and "Lamellae adnexae 1. liberae. Rígidi" (p. 294). Later (1836-1838) Fries recognized two sections: *Rígidi* (p. 225) and *Tenaces* (p. 227); this latter divided in three groups: **lamellis planis ventricosus liberis adnatisve*, ***lamellis planis, postice latissimis subdecurrentibus*, ****lamellis sublinearibus adscendentibus*, that later (1849) be recognized as strips: *Agaricus ericacei*, *A. bullacei* and *A. calosi* (see also Donk, 1962 and Kühner, 1978, p. 264).

Singer (1962) recognized 5 sections in the genus *Psilocybe*: 1) *Merdariae* (Fr.) Sing., 2) *Caerulescentes* Sing., 3) *Psilocybe*, 4) *Atrobrunnea* Sing., and 5) *Deconica* (Smith) Sing., but the differences between them are not clear. The Section *Caerulescentes* has almost all the features of the other sections, except the bluing feature. This Section was based on *P. cubensis* (Earle) Sing. (Singer 1948), but Singer & Smith (1958b) present a monograph of the Section including many different species to *P. cubensis* in spores, pleurocystidia, cheilocystidia, and habit and even in habitat. *P. cubensis* was considered by Heim (1956a, b; 1963; Heim & Hofmann, 1958a; and Heim & Wasson, 1958) as *Stropharia cubensis* Earle.

The Section *Deconica* is confused with Section *Psilocybe*, because was based on *P. crobula* (Fr.) M. Lange ex Sing., and on *P. goniospora* (B. & Br.) Sing. (Singer, 1961) which are now considered members of the Section *Psilocybe* (the former), and of the Section *Cordisporae* Guzmán (the latter). *Deconica* was considered a subgenus of *Psilocybe* by Lange (1936).

The Section *Psilocybe* of Singer (1963) is based in *P. semilanceata*, the type of the genus. In this Section Singer also included *P. paupera* Sing., and *P. callosa* (Fr. ex Fr.) Quél. Later Singer (1975) continued recognized the same sections of 1963, but he added also two more sections, *Septembres* Sing. and *Chrysocystidiatae* Sing., and changed the name of the Section *Psilocybe* for *Tenaces* (Fr.) Sacc. because the type species of the genus now recognized is *P. montana*, instead of *P. semilanceata*, then *P. montana* belongs to the Section *Psilocybe*, named in 1963 as Sect. *Deconica*.

Section *Tenaces* was described by Saccardo (1887) based in Fries' Section (1936), where Saccardo included more than 34 species, as *P. semilanceata*, *P. caerulipes*, *P. callosa* and others, and many now excluded, as *P. sarcocephala*, *P. ericaea*, *P. uda*, *P. polytrichi*, etc., and other now consider doubtful species, as *P. alboquadrata*, *P. taediosa*, *P. pertinax*, *P. nemophila*, *P. dichroa*, *P. corneipes*, etc., then, Sect. *Tenaces* is a complex group, preferable to exclude. In the present work *P. semilanceata* together with *P. callosa*, *P. caerulipes* and other is included in a new Section named Section *Semilanceatae*, as will discuss below.

Section *Septembris* Sing. was based on *P. septembris* Sing. (Singer, 1973), and Sect. *Chrysocystidiatae* Sing. was based on *P. chrysocystidiata* Sing. (Singer, 1973), both confused species as will discuss in the chapter of Doubtful species of this monograph.

Section *Atrobrunneae* Sing. (Singer, 1948) and Section *Merdariae* (Fr.) Sing. (Singer, 1949) are based on *P. atrobrunnea* (Lasch) Gillet (the former), and on *P. merdaria* (Fr.) Ricken (the latter); they are considered natural sections.

In this monograph *Psilocybe* is divided in 18 Sections, based mainly on the form, color, and thickness of the wall of the spores, color of both pleurocystidia and cheilocystidia, on the presence or absence of an annulus, and in the bluing reaction. The 18 recognized Sections are:

- 1) Sect. *Brunneocystidiatae* Guzmán
- 2) Sect. *Blattariopsidae* Guzmán
- 3) Sect. *Subaeruginosae* Guzmán
- 4) Sect. *Cordisporae* Guzmán
- 5) Sect. *Psilocybe*
- 6) Sect. *Mexicanae* Guzmán
- 7) Sect. *Stuntzae* Guzmán
- 8) Sect. *Coprophilae* Guzmán
- 9) Sect. *Merdariae* (Fr.) Sing.
- 10) Sect. *Cubensae* Guzmán
- 11) Sect. *Zapotecorum* Guzmán
- 12) Sect. *Singerianae* Guzmán
- 13) Sect. *Pratensae* Guzmán
- 14) Sect. *Atrobrunneae* Sing.
- 15) Sect. *Squamosae* Orton emend. Guzmán
- 16) Sect. *Aztecorum* Guzmán
- 17) Sect. *Cyanescens* Guzmán
- 18) Sect. *Semilanceatae* Guzmán

Of these 18 sections, only Sect. *Merdariae* (Fr.) Sing., Sect. *Atrobrunnea* Sing. and Sect. *Squamosae* Orton, and the type section are previously described. Fourteen sections are proposed as new and further described. In the following chapter, the phylogeny of the 18 sections is presented, and a key is to be found in chapter 5. The phylogeny of the sections is based on the color of the pleurocystidia and cheilocystidia, on the size and form of the spores and on the thickness of the spore wall, the blue staining reaction of the fresh fruiting bodies, presence of an annulus, and on the hygrophanous feature of the pileus.

4. Phylogeny of the sections

It is known that the fungi of the tropical regions generally have small spores in comparison with those of high mountains or from the temperate regions. In the genus *Scleroderma* (Guzmán, 1970) the tropical species such as *S. sinnamariense* Mont., *S. dictyosporum* Pat., *S. stellatum* Berk., and others, have small spores, but those from the temperate regions such as *S. areolatum* Ehrenb., *S. citrinum* Pers., *S. macrorrhizon* Wall., *S. hypogaeum* Zeller, *S. michiganensis* (Guzmán) Guzmán, and others have large spores.

Heim (1957c, and in Heim & Wasson, 1958) was surprised to find that *Psilocybe aztecorum* in the high mountains of Mexico had the largest spores of any in the group of the hallucinogenic species. In fact, the other species considered by Heim as *P. cordispora*, *P. caerulea* and *P. mexicana* have spores not more than 12 μ m long, and they grow in subtropical regions, as Huautla de Jiménez, State of Oaxaca, but *P. aztecorum* has spores (10.4-) 12-14 (-17) μ m long, and only grows in the cold high mountains of Central Mexico (Guzmán, 1978b).

On the other hand, those species with the brown, brownish or yellowish red pleurocystidia and/or cheilocystidia reported recently by Guzmán (1978c, 1979), Guzmán & Horak (1978), and Guzmán & Watling (1978) in the genus *Psilocybe*, are considered as belong to a phylogenetic line of species with small rhomboid spores, common in the tropics. This line is represented by Section *Brunneocystidiatae*, and in three species in temperate, subtemperate or subtropical regions: *P. blattariopsis* (Speg.) Sing. (Section *Blattariopsidae*), and *P. subaeruginosa* Clel. and *P. paupera* Sing. (both of the Section *Subaeruginosae*).

All the species of the Section *Brunneocystidiatae* have brown or brownish pleurocystidia, and small rhomboid spores (not more than 10 μ m long), and they are common in the tropics. This Section is considered the most primitive in *Psilocybe*, considering that the biologist accept that in the tropical rain forests began the terrestrial life in the world through the forests of pteridophytes, and also considering the fact that all the tropical species of *Psilocybe* have small spores in contrast with those species from the temperate zones that have large spores (12-14 μ m or even 16-22 μ m long). Then the Sect. *Brunneocystidiatae* was originated in the tropics. Sections *Blattariopsidae* and *Subaeruginosae* that are only known in South America and Australia are considered to have originated from Section *Brunneocystidiatae*. *P. blattariopsis* (Speg.) Sing. is only known in Brazil and *P. subaeruginosa* Clel., seems endemic in Australia. The other Sections of the genus without brown or brownish pleurocystidia began probably through some line of the Section *Brunneocystidiatae*. The earliest were Sections *Cordisporae* and *Zapotecorum*, both

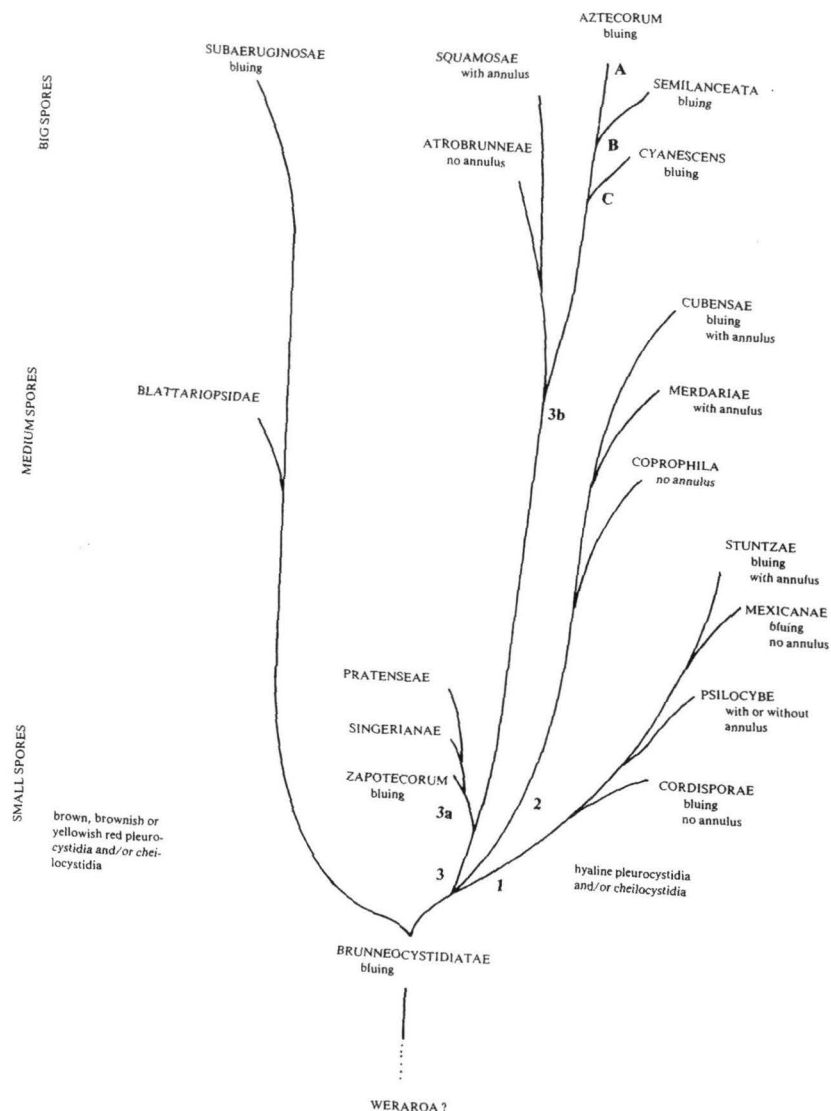


Plate 10: Probably phylogeny of the sections in the genus *Psilocybe*. 1: Rhomboid spores line. 2: Subhexagonal spores line. 3: Subellipsoid spores line (3a: thin walled spores; 3b: thick walled spores). Above, A: strongly hygrophonous, drying whitish; B & C not so strongly hygrophonous, at least not dry whitish; B: without pleurocystidia; C: with pleurocystidia.

with hyaline cystidia and small spores. They are very common in the subtropics, but *P. plutonia* (B. & Br.) Sacc. (Sect. *Coridisporae*) also grows in the Amazonas, besides Cuba and Venezuela.

The Sections *Cordisporae*, *Psilocybe*, *Mexicanae* and *Stuntzae* are within the rhomboid-spore line, known only from the subtropics and temperate regions. A second development from the Section *Brunneocystidiatae* is represented by the Sections *Coprophilae*, *Merdariae* and *Cubensae*. All the species have subhexagonal spores and are common in the tropics, subtropics and temperate regions. *P. coprophila* is common in tropic and subtropic regions, and *P. merdaria* is only known in temperate regions. *P. cubensis* in subtropic regions, but *P. subcubensis* is known in the tropic and subtropic zones. All the species of these three Sections are mainly coprophilous.

A third phylogenetic line from the Section *Brunneocystidiatae* is characterized by subellipsoid spores. It divides into two lines, one with thin walled spores, and the other with thick walled spores. The former contains the Sections: *Zapotecorum*, *Singerianae* and *Pratensae*, and the latter with the Sections: *Atrobrunnea*, *Squamosae*, *Aztecum*, *Cyanescens* and *Semilanceatae*.

It is interesting to observe that in *P. zapotecorum* a species common in the subtropics regions of Mexico and South America, sometimes has brownish pleurocystidia (the pleurocystidia are hyaline but sometimes they present a brownish tint in the base). This feature connects the Section *Zapotecorum* with its tropical ancestors in the Section *Brunneocystidiatae*. In *P. dumontii* and *P. furtadona* of the Sect. *Cordisporae* the cheilocystidia are sometimes brownish toward the base, and related these species with Sect. *Brunneocystidiatae*. The bluing reaction also connects both Sections. Another interesting observation is that the three Sections with thin walled spores (*Zapotecorum*, *Singerianae*, and *Pratensae*) are common from the subtropics to the temperate regions, but all the members of the line with thick wall spores are only known in the temperate and cold weather regions.

Table 10 represents the probably phylogeny of the genus *Psilocybe*. Note in this figure the two phylogenetic lines, one (on the left) with brown cystidia and the other (on the right) with hyaline cystidia, and the evolution from small (in the base) to large spores (above), from the tropics to the temperate regions. The Section *Brunneocystidiatae* is presently known only from the tropical species of Mexico and New Guinea. It is very probable that this Section has a wide distribution throughout the tropics, but the lack of mycological explorations in the tropics and the destruction of tropical rain forests makes difficult for the moment to know more of this interesting and primitive group of *Psilocybe*.

The bluing reaction is distributed throughout 10 sections of the genus. It is interesting to note that not only the two more primitive sections, *Brunneocystidiatae* and *Cordisporae*, are bluing, but also the more advanced sections, e.g., *Aztecum* and *Semilanceatae*. As mentioned above Secotiaceous fungi such as *Weraroa* Sing. are very similar to the gasteromycetoid forms observed in the cultures of *P. merdaria* and *P. coprophila*, and is probably the origin of the genus *Psilocybe* (Singer, 1958).

This interesting Secotiaceous fungus has bluing reaction. The Sections *Psilocybe* and *Cordisporae* are very similar. Only the bluing reaction and their distribution separated them. The species of the Section *Cordisporae* are very common in the subtropic regions, but the species of the Section *Psilocybe* are more common in temperate regions.

It is probable that the genera *Naematoloma* and *Stropharia*, originated from the species of *Psilocybe* with brown, brownish or yellowish-red pleurocystidia, connecting these colored cystidia with the chrysocystidia found in those genera. Guzmán (1980) found that the tropical species of *Naematoloma* have rhomboid small spores.

About the significance of the size of the spores and the thickness of the wall in the genus *Psilocybe*, as far as the survival of the species is concerned, the thickness of the wall is important in survival *per se*. It is postulated that in tropical regions where the weather (temperature and humidity) is favorable for growth the year around, there is no pressure (evolution wise) to develop large or thick walled spores. But the fungi of the temperate regions have endure severe winters and droughts, and they need increase the size for nutrient content of the spores. The thick wall avoids excessive water loss during dry periods, and the added nutrient supply in large spores increases the chance of survival of the mycelium which grows out of the spore. The occurrence of tropical species with thick-walled spores and others with spores with thin walls may mean that weather conditions have changed from sometime in the past. In any event is interesting to observe that all the tropical species of *Psilocybe* have small spores (thin-walled in Sect. *Zapotecorum*), and thick-walled in Sect. *Brunneocystidiatae* and in Sect. *Cordisporae*. But the temperate species have big spores, except those in sections *Psilocybe* and *Pratensae*, probable for their tropical origin.

5. Key to the Sections

- 1a. Pleurocystidia or cheilocystidia brown, or chocolate brown, or brownish, with homogeneous content. Thick-walled spores ($\approx 1 \mu\text{m}$ thick) (if thin-walled see 13a). 2
- 1b. Pleurocystidia (if present) and cheilocystidia (if present) hyaline (at least the great majority). 4
- 2a. Spores not more than $8 \mu\text{m}$ long, rhomboid or subrhomboid in face view (see Plate 1). Tropical or subtropical species staining blue. Sect. *Brunneocystidiatae* (pag. 81)
- 2b. Spores more than $8 \mu\text{m}$ long. 3
- 3a. Spores subellipsoid both in face and side view (see Plate 1). Stipe without annulus. Australian and South American species. Staining blue or not. Sect. *Subaeruginosae* (pag. 102)
- 3b. Spores subhexagonal in face view (see Plate 1). Stipe with annulus. South American species. Non staining blue. Sect. *Blattariopsidae* (pag. 100)
- 4a. Spores rhomboid, subrhomboid or subhexagonal in face view (see Plate 1). 5
- 4b. Spores ellipsoid or subellipsoid both in face and side view (see Plate 1). 11
- 5a. Spores rhomboid or subrhomboid in face view (see Plate 1). 6
- 5b. Spores subhexagonal in face view (see Plate 1), more than $10 \mu\text{m}$ long. Coprophilous or subcoprophilous species (except in few cases that grow on refuse matter or rich soil). 9
- 6a. Non bluing temperate species. Spores not more than $10 \mu\text{m}$ long. Without pleurocystidia (if pleurocystidia present, see 13b: Sect. *Singerianae*, or 15b: Sect. *Atrobrunnea*). Fruit bodies 5-20 mm diam., rarely 30 mm diam. Sect. *Psilocybe* (pag. 153)
- 6b. Staining blue or fading to blackish when dried. Occurring in temperate or subtropical regions. 7
- 7a. With annulus. Temperate and subtropical species. Sect. *Stuntzae* (pag. 212)
- 7b. Without annulus. 8
- 8a. Spores more than $8 \mu\text{m}$ long. Subtropical species. Sect. *Mexicanae* (pag. 199)
- 8b. Spores not more than $8 \mu\text{m}$ long. Tropical or subtropical species (except *P. columbiana* that has spores up to $8.8 \mu\text{m}$ long and grows on cold high mountains ("páramos") of Colombia). Sect. *Cordisporae* (pag. 106)
- 9a. Without annulus. Not staining blue (for species staining blue see 8a: Sect. *Mexicanae*). Sect. *Coprophilae* (pag. 221)
- 9b. With annulus, or at least veil remaining on the stipe very conspicuously. 10

- 10a. Staining blue. Tropical or subtropical species. Sect. *Cubensae* (pag. 245)
- 10b. Not staining blue. Temperate and subtropical species. Sect. *Merdariae* (pag. 234)
- 11a. Spores thin walled (no more than $0.8 \mu\text{m}$ thick). 12
- 11b. Spores thick walled (more than $0.8 \mu\text{m}$ thick) of if they are thin walled and bluing species, the pleurocystidia are absent. 14
- 12a. Pleurocystidia absent. Temperate, non staining blue species (if bluing species see 13a). Sect. *Pratensae* (pag. 288)
- 12b. Pleurocystidia present (if absent, staining blue temperate species). 13
- 13a. Subtropical species staining blue. Pleurocystidia hyaline (sometimes brownish at the base). Sect. *Zapotecorum* (pag. 252)
- 13b. Tropical or subtropical species not staining blue. Pleurocystidia always hyaline. Sect. *Singerianae* (pag. 272)
- 14a. Not staining blue species. 15
- 14b. Staining blue. Temperate species. 16
- 15a. Annulus present. Spores more than $11 \mu\text{m}$ long. Sect. *Squamosae* (pag. 314)
- 15b. Annulus absent. Spores not more than $11 \mu\text{m}$, or if these are larger, the habitat is on *Sphagnum* or on dung. Sect. *Atrobrunnea* (pag. 299)
- 16a. Strongly hygrophanous pileus, drying whitish. Spores asymmetric in side view (see Plate 1). Sect. *Aztecorum* (pag. 323)
- 16b. Moderately hygrophanous pileus, or at least not drying whitish. Spores not asymmetric. 17
- 17a. Pleurocystidia absent. Stipe with or without annulus. Sect. *Semilanceatae* (pag. 342)
- 17b. Pleurocystidia present. Annulus absent. Sect. *Cyanescens* (pag. 332)

DESCRIPTION OF THE SPECIES

Section *Brunneocystidiatae* Guzmán, sect. nov.

Pleurocystidiis brunneous, vel spadiceous, sed non chrysocystidatis. Cheilocystidiis hialinis vel brunneous, vel spadiceous. Sporis rhomboideus. Caerulescentes species. Typus: *P. brunneocystidiata* Guzmán et Horak.

Pleurocystidia brown or brownish, homogeneous, not of the chrysocystidial type. Cheilocystidia hyaline or sometimes as the pleurocystidia. In one species (*P. inconspicua* Guzmán & Horak) the pleurocystidia are absent, but the cheilocystidia are brown to brownish. Spores rhomboid in face view, thick walled ($\pm 1 \mu\text{m}$ thick). Tropical or subtropical species staining blue.

Species considered in this section are: 1. *P. banderillensis* Guzmán, 2. *P. brunneocystidiata* Guzmán & Horak, 3. *P. heimii* Guzmán, 4. *P. inconspicua* Guzmán & Horak, 5. *P. pleurocystidiosa* Guzmán, 5. *P. rzedowskii* Guzmán, 7. *P. singeri* Guzmán, 8. *P. uxapanapensis* Guzmán, 9. *P. veraecrucis* Guzmán & Pérez-Ortiz, and 10. *P. weldenii* Guzmán.

Key to the species

- 1a. Pleurocystidia absent. Cheilocystidia fusoid to vesiculose, brown to brownish, few are hyaline, $20\text{--}30 \times 7\text{--}14 \mu\text{m}$. Pileus 5–10 mm diam. Species known only from New Guinea. 4. *P. inconspicua*
- 1b. Pleurocystidia present. 2
- 2a. Cheilocystidia brown to hyaline. 3
- 2b. Cheilocystidia always hyaline. 4
- 3a. Cheilocystidia more hyaline than brownish; when hyaline they are lageniform or irregularly branched, $15\text{--}21 \times 5.5\text{--}6.6 \mu\text{m}$; when brown they are ventricose fusiform to submucronate, $18\text{--}35 \times 5.5\text{--}17.6 \mu\text{m}$. Species known only from tropical rain forests of Mexico. 10. *P. weldenii*
- 3b. Cheilocystidia more brownish than hyaline, lageniform or sublageniform, some irregularly bifurcated or branched, $16\text{--}21 \times 5\text{--}6 \mu\text{m}$. Species known only from subtropical forests of Mexico. 5. *P. pleurocystidiosa*
- 4a. Cheilocystidia frequently branched. 5
- 4b. Cheilocystidia not branched (see also 7b). 8

- 5a. Pleurocystidia irregular in form and branched, not mucronate or with a broad rounded head. Cheilocystidia polymorphous, lageniform fusoid-ventricose or moniliform. Species known only from tropical rain forests or at least from coffee plantations of Mexico. 6
- 5b. Pleurocystidia uniform in shape, not branched, frequently acutely mucronate. Cheilocystidia uniform in shape. Species known only from subtropical forest of Mexico. 7
- 6a. Spores (3.8-) 4.9-5.5 (-7.7) μm long. Stipe with a irregular pseudorhiza. 7. *P. singeri*
- 6b. Spores (4.9-) 6-7 (-9.9) μm long. Stipe without pseudorhiza. 9. *P. veraecrucis*
- 7a. Cheilocystidia 23-34.5 μm long, frequently moniliform, strongly and irregularly branched, with acute apex. Spores (5-) 6-6.5 (-7.7) $\times$ 4.9-6.5 (-7) μm 3. *P. heimii*
- 7b. Cheilocystidia 16-27 μm long, frequently sublageniform, not very branched. Spores (4.5-) 5-6.6 (-8) $\times$ (3.8-) 4.4-5.5 (-6) μm 1. *P. banderillensis*
- 8a. Cheilocystidia uniform in shape, ventricose-rostrate with a more or less elongated neck. Pleurocystidia fusoid-ventricose or ventricose-subrostrate, slightly mucronate. Species known only from a subtropical forest of Mexico. 6. *P. rzedowskii*
- 8b. Cheilocystidia polymorphous. 9
- 9a. Pleurocystidia ventricose-papillate or shortly mucronate, not branched. Cheilocystidia 10-20 $\times$ 3-5 μm . Species known only from New Guinea. 2. *P. brunneocystidiata*
- 9b. Pleurocystidia fusoid-ventricose, with a more or less elongated neck, sometimes branched. Cheilocystidia 19.8-38.5 $\times$ 5.5-8.8 μm . Species known only from tropical forests of Mexico, at Uxpanapa region. 8. *P. uxpanapensis*

1. *Psilocybe banderillensis* Guzmán *Nova Hedwigia* 29: 642, 1978. Figs. 4-7

Pileus 5-15 (-25) mm diam., conic to subumbonate, papillate, glabrous, even but slightly striate at the margin by translucence when moist, subviscid to lubricous, hygrophanous, reddish brown to darker on the margin, finally blackish brown; readily staining blue when touched.

Lamellae adnate, pale dark violet brown, sometimes with whitish subfloccose edges.

Stipe 80-95 $\times$ 1-2 mm, equal or slightly thickened at the base, hollow, hypogeous almost one half of the total length, reddish brown above to blackish toward the base; covered with white floccose scales mainly in the middle portion.

Veil forming a fugacious white cortina, soon evanescent.

Context pliant, more or less concolorous with the pileus or somewhat paler; odor and taste farinaceous; staining deep blue where injured.

Spores (4.5-) 5-6.6 (-8) $\times$ (3.8-) 4.4-5.5 (-6) $\times$ 3.3-4 μm , rhomboid in face view, subellipsoid in side view, thick walled, dark yellowish brown, with a broad germ pore.

Basidia 15-25 $\times$ 9-12 μm , 4-spored, hyaline, ventricose to subpyriform.

Pleurocystidia 16-30 $\times$ 6.6-13 μm , scarce, brownish or reddish-yellowish, rarely are hyaline, variable in form, fusiform or ventricose, often with a mucro, or with a short neck, or their are sublageniform.

Cheilocystidia 16-27 $\times$ 3.3-6 μm , abundant, sublageniform or fusiform-lanceolate with an elongated, flexuous, short or long neck 1.1-2.2 μm diam., sometimes irregularly bifurcate, some with a viscid hyaline drop at the apex.

Subhymenium subcellular, with incrusted yellowish brown pigment; hyphae 5-10 μm diam., frequently turning blue (in KOH). Trama regular, yellowish brown, with pigment irregularly incrustated on the walls of the hyphae, 12-22 μm diam, with thick (1.5 μm) walls. Epicutis a more or less gelatinized layer, with hyaline to brownish parallel hyphae, 2-5 μm diam. Hypodermium a compact layer of pigmented and elongated hyphae, 5-10 μm diam., more or less incrustated on the walls. Clamp connections common.

HABITAT AND DISTRIBUTION. Solitary or in small groups on soil or humus, in deciduous forests (or subtropical forests), with *Liquidambar styraciflua*, at 1500-1700 m elevation. Known only from Mexico. Fruiting in summer.

STUDIED MATERIAL. MEXICO, State of Veracruz, near Banderilla, Cerro La Martinica, Guzmán 16365 (Type ENCB; Isotype NY). Chiconquiaco to Santa Rita road, near Paso Enriquez, Guzmán 17018 (ENCB). State of Oaxaca near Ayotla, Finca Carlota, Jacobs 49 (ENCB).

DISCUSSION. This species is close to *P. heimii* Guzmán but differs in the form of the cheilocystidia; in that species they are frequently moniliform and strongly and irregularly branched, and the spores in *P. heimii* are broader ($\times$ 4.9-5.6 (-7) μm). The specimens from Paso Enriquez and Finca Carlota are new records of the species. Guzmán (1978c) reported only this species from Banderilla. The name of the species is based on the type locality name.

2. *Psilocybe brunneocystidiata* Guzmán & Horak *Nova Hedwigia* 31: 45, 1978. Figs. 8-12

Pileus (3-) 9-40 mm diam., conic when young to convex or expanded in mature specimens, but always with a sharp conical papilla, hygrophanous, brown to yellowish brown or stramineous color, dry, glabrous, even except for dense whitish fibrillose squamules along the margin from the veil, striate towards the margin when moist.

Lamellae broadly adnate to subdecurrent, brownish to cocoa brown, edge fimbriate and whitish.

Stipe 10-40 × 1-2 mm, cylindrical, equal, flexuous, hollow, somewhat fragile, concolorous with the pileus, covered with white floccose squamules.

Veil inconspicuous except for the appressed silky fibrils on the stipe and on the pileus.

Context fleshy, pale brown in pileus and stipe. Odor and taste slightly farinaceous.

Spores print dark brown.

Spores (5-) 6-6.5 (-7) × 5.5-6 × 3.8-4.5 μm, subrhomboid in face view, or subellipsoid in side view, thick walled, yellowish brown, broadly flattened germ pore present.

Basidia 18-24 × 4.5-6 μm, 4-spored, hyaline, subventricose, occasionally with a median constriction, sterigmata 2-4 (-7) μm long.

Pleurocystidia 20-33 × 6.5-9 (-11) μm, brown, rarely hyaline, ventricose-papillate, apical papilla 2-3.5 μm diam.

Cheilocystidia 10-20 × 3-5 μm, 1-2.5 μm at apex, abundant, forming a sterile band, hyaline, polymorphous, ventricose-rostrate, clavate, or strangulate, or mucronate.

Subhymenium composed of irregular globose cells (subcellular), conspicuously encrusted with brown to yellowish pigment. Trama regular, consisting of elongate cylindric elements, 4.5-8 μm diam., pigmented like the subhymenium. Epicutis a more or less gelatinized layer of cylindric hyaline filamentous, but encrusted with brown yellowish pigment. Hypodermium formed by elongate to subglobose hyaline elements, encrusted with brownish pigment. Clamp connections present.

HABITAT AND DISTRIBUTION. Gregarious or caespitose on rotten wood in subtropical forests. Known hosts: *Castanopsis acuminatissima* and *Nothofagus* spp. Known only from Papua New Guinea, at 500-2000 m elevation.

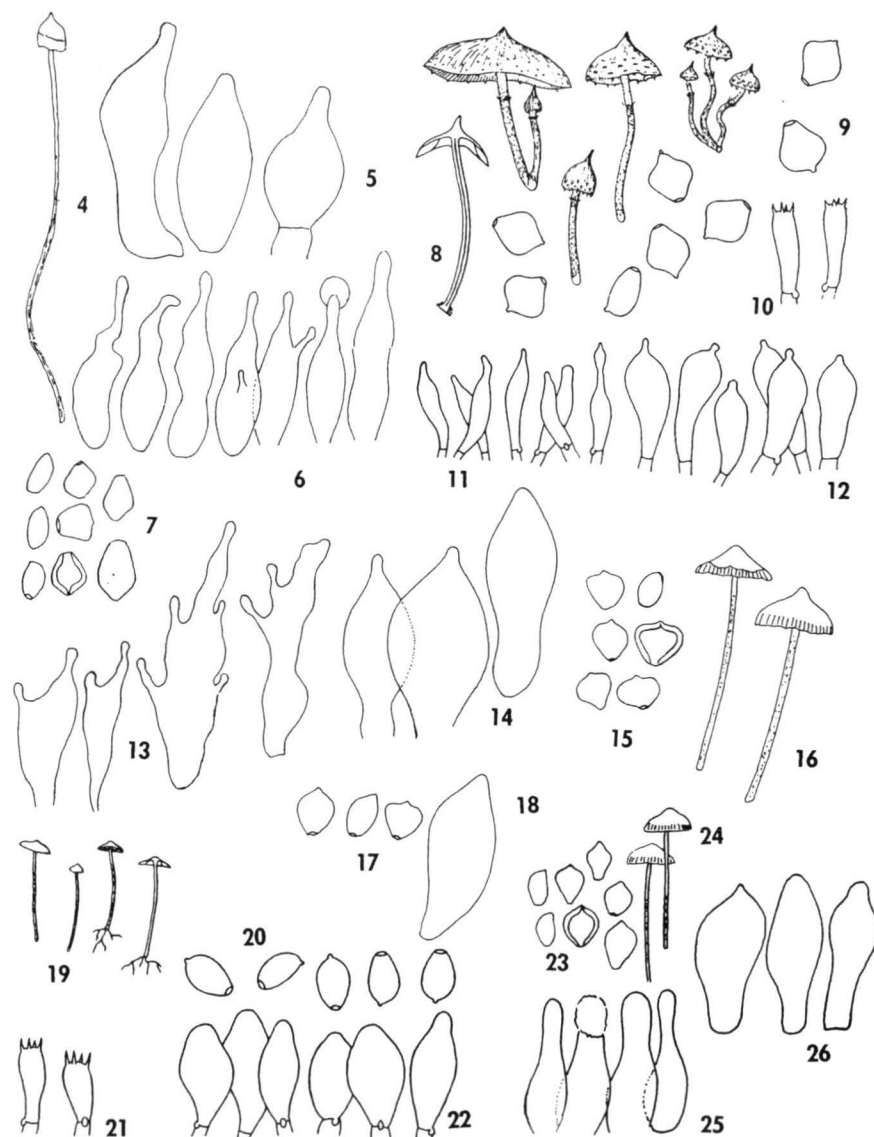


Plate 11: Figs. 4-26. - Several species of *Psilocybe*. 4-7: *P. banderillensis*, 4: Carpophore, 5: Pleurocystidia, 6: Cheilocystidia 7: Spores (all from the type). 8-12: *P. brunneocystidiata*, 8: Carpophores, 9: Spores, 10: Basidia, 11: Cheilocystidia, 12: Pleurocystidia (all from the type). 13-18: *P. heimii*, 13: Cheilocystidia, 14: Pleurocystidia, 15: Spores, 16: Carpophores, 17: Spores, 18: Pleurocystidia (13-16: Type: 17-18: Guzmán 1919). 19-22: *P. incospicua*, 19: Carpophores, 20: Spores, 21: Basidia, 22: Cheilocystidia (all from the type). 23-26: *P. rzedowskii*, 23: Spores, 24: Carpophores, 25: Cheilocystidia, 26: Pleurocystidia (all from the type).

STUDIED MATERIAL. PAPUA-NEW GUINEA, Morobe District, Bulolo, Manki, Horak s.n. (Type ZT, 72/212; isotype ENCB). Bulolo, Heads Hump, Horak s.n. (ZT, 71/226).

DISCUSSION. *P. brunneocystidiata* is closely related to *P. uxpanapensis* Guzmán, known only from a tropical forest of Mexico, but the pleurocystidia in that species are fusoid-ventricose, non-papillate, with a more or less elongated neck. On the other hand, the cheilocystidia in *P. uxpanapensis* are $19.8\text{--}38.5 \times 5.5\text{--}8.8 \mu\text{m}$. It is also close to *P. mammillata* (Murr.) Smith and *P. yungensis* Sing. & Smith, but differs in the presence of brown pleurocystidia, absent in those species. It is probably that this fungus is hallucinogenic for it is closely related to known hallucinogenic species.

The name of the species means the brown pleurocystidia.

3. *Psilocybe heimii* Guzmán *Nova Hedwigia* 29: 643, 1978. Figs. 13-18 & 667

Pileus 15-35 mm diam., convex to subumbonate or subcampanulate, papillate, even but translucent-striate at the margin when moist, or sometimes subrimose with age, glabrous, with lobed to irregular margin, subviscid, dark brown to brownish yellowish, hygrophanous, staining blue to darker.

Lamellae adnate or subadnate, dark brown violet, with whitish subfloccose edges.

Stipe 50-80 $\times$ 1.5-2.5 (-4) mm, equal, hollow, whitish to brownish, or reddish, covered with small silky whitish fibrils.

Veil thin and leaving fine appressed silky fibrils on the stipe, soon evanescent.

Context pliant, whitish and thin in the pileus, reddish brown in the stipe; odor and taste strongly farinaceous. Pileus, stipe, and context staining green blue to blackish when bruised.

Spore print purple brown violet.

Spores (5-) 6-6.5 (-7.7) $\times$ 4.9-6.5 (-7) $\times$ 3.3-4 μm , rhomboid or subglobose in face view, subellipsoid in side view, with a short basal appendage and with a narrow germ pore, thick wall, dark yellowish brown.

Basidia 15-20 $\times$ 5.5-7 μm , 4-spored, hyaline, ventricose or subclavate.

Pleurocystidia 19.8-27.5 $\times$ 10-14 μm , brownish to hyaline, ventricose fusoid with acute or mucronate apices, having a slight constriction at the base.

Cheilocystidia 23-34.5 $\times$ 5.5-9.9 μm , hyaline, abundant, forming a sterile band, ventricose to moniliform, strongly and much branched and very irregular in form, with acute apices.

Subhymenium composed of subglobose elements, dark yellow brownish with pigment irregularly incrustated on the walls, with blue reaction when observed in KOH. Trama parallel, hyaline or yellowish, with thick walled (1.5 μm) hyphae,

10-35 μm diameter. Epicutis subgelatinous, with parallel hyaline to brownish hyphae, up to 4 μm in diameter, with the pigment irregularly incrustated on the walls. Hypodermium with elongated hyaline or brownish hyphae, thick walled like those of the trama. Clamp connections present.

HABITAT AND DISTRIBUTION. Solitary or in small groups on humus or muddy soil in deciduous forests of *Liquidambar-Quercus*, at 500-1400 m elevation. Known from subtropical forests of Mexico only. Fruiting in summer.

STUDIED MATERIAL. MEXICO, State of Oaxaca, Huautla de Jiménez region, near Rancho El Cura, Guzmán 900-B (Type ENCB, Isotype MICH and NY) (in MICH as *P. cordispora*); Guzmán 1919 (ENCB). Puente de Fierro, Morlan 41-76 (ENCB). La Regadera to Chichotla, Jacobs 52 (ENCB). Near Chichotla, Jacobs 26 (ENCB). Near Ayautla, Jacobs 55 (ENCB). Jalapa de Díaz to Ayautla, Jacobs 43 (ENCB). Tuxtepec to Oaxaca road, near Vista Hermosa, Guzmán 17665 (ENCB).

DISCUSSION. This species is similar to *P. cordispora* Heim or *P. yungensis* Sing. & Smith in the form of the carpophore and spores, but differs in the branched cheilocystidia and in the brown pleurocystidia. It differs from *P. banderillensis* Guzmán in the form of the cheilocystidia, more lageniform and not branched, as well as its the broader spores. The specimens from Puente de Fierro, Ayautla, and Vista Hermosa are new records for this species. Guzmán (1978c) reported this species only from Huautla de Jiménez region.

The name of the species is to the memory of Prof. Roger Heim, who made with Mr. Wasson, important studies on the Mexican hallucinogenic fungi. Prof. Heim kindly gave at Paris to the author isotypes of all his species from Mexico for deposit in ENCB.

4. *Psilocybe inconspicua* Guzmán & Horak *Sydowia* 31: 50, 1978. Figs. 19-22

Pileus 5-10 mm diam., convex to subumbonate, with a small conical papilla, margin incurved in young carpophores, pale or deep ochre brown or sienna brown, glabrous, even, but margin slightly striate when fresh, dry, without veil remnants.

Lamellae broadly adnate to occasionally subdecurrent, very densely crowded, argillaceous to purple brown, edges white and sometimes conspicuously fimbriate.

Stipe 20-25 $\times$ 0.5-1 mm, cylindric, brittle, concolorous with pileus or paler, covered with white appressed fibrils, base white from mycelium, often with white rhizoids.

Veil rudimentary as white cortina, soon evanescent.

Context thin, concolorous with pileus. Odor and taste not distinctive.

Spore print brown.

Spores 5.5-6.5 (-7) $\times$ (3.5-) 4-5 $\times$ 3.3-3.8 μm , subrhomboid in face view, subellipsoid in side view, yellowish brown, moderately thick walled, with a broad germ pore, and short apiculus.

Basidia $17.5\text{--}22 \times 5.5\text{--}6.5 \mu\text{m}$, 4-spored, ventricose or subpyriform, hyaline.

Pleurocystidia absent.

Cheilocystidia $20\text{--}30 \times 7\text{--}14 \mu\text{m}$, brown to brownish, some hyaline, broadly fusoid to subventricose, abundant, forming sterile gill-edge.

Subhymenium subcellular, formed by globose elements irregularly incrustated with brown-orange pigment. Trama regular, hyaline or incrustated as the subhymenium. Epicutis a layer of subgelatinized, brownish parallel hyphae, incrustated with brown pigment. Hypodermium of cylindric hyaline hyphae, non so incrustated. Clamp connections present.

HABITAT AND DISTRIBUTION. Gregarious in small groups on soil, among debris in *Araucaria cunninghamii* forests. Known from Papua, New Guinea only. Fruiting in January.

STUDIED MATERIAL. PAPUA, NEW GUINEA, Morobe District, Bulolo, Susu, Horak s.n. (Type ZT 72/751, Isotype ENCB).

DISCUSSION. This is a small and inconspicuous species of *Psilocybe*. It is a very distinct species because of the absence of pleurocystidia, the known only in the Section. Due that *P. inconspicua* is related to the hallucinogenic species, it is likely that this fungus is a hallucinogenic, but no bluing reaction is known.

The name of the species means the non conspicuous or non prominent carpophore from the soil.

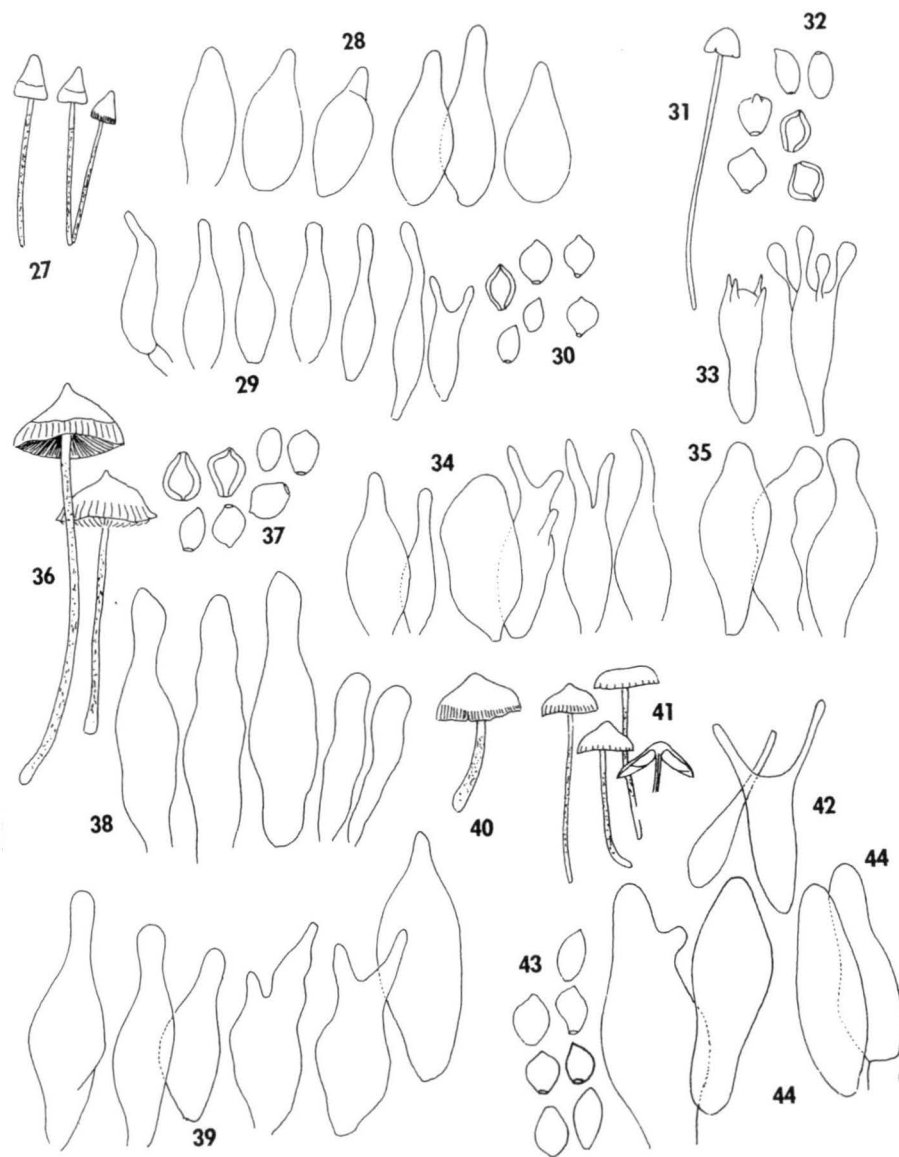


Plate 12: Figs. 27-44. - Several species of *Psilocybe*. 27-30: *P. pleurocystidiosa*, 27: Carpophores, 28: Pleurocystidia, 29: Cheilocystidia, 30: Spores (all from the type except Fig. 25 from Morlan 42-76). 31-35: *P. weldenii*, 31: Carpophore, 32: Spores, 33: Basidia, 34: Pleurocystidia, 35: Cheilocystidia (all from the type). 36-39: *P. uxpanapensis*, 36: Carpophores, 37: Spores, 38: Cheilocystidia, 39: Pleurocystidia (all from the type). 40-44: *P. veraecrucis*, 40-41: Carpophores, 42: Cheilocystidia, 43: Spores, 44: Pleurocystidia (all from the type, except Fig. 40 from Guzmán 17433-A).

5. *Psilocybe pleurocystidiosa* Guzmán, sp. nov.

Figs. 27-30

Pileus 5-15 (-25) mm latus, conicus demum subumbonatus, laevis, marginis substriatus, suboleosus, hygrophanus, fulvus vel cacinus vel spadiceus. Lamellae subadnatae, brunneae atroviolaceae. Stipe 20-50 × 1-2 mm, albidus vel brunneus violaceus, floccosus istorsum basis. Carne pileus concolor vel nigricans. Sporis (4.9-) 5.5-6 (-7.1) × (4.4-) 5-5.5 (-7) µm, rhomboideae vel subellipsoideis crassae tunicatis. Pleurocystidiis 16.5-24 × 7.7-12 µm, copiosa, hyalina vel brunneola, rari caerulescentes. Cheilocystidiis 16-21 × 5-6 µm, brunneae aurantiacae. Hyphys tramata, subhymenium et hypodermium crassitunicatis et crustotunicatis. Epicutis subgelatiniscentibus inconspicuis. Ad terram vel humus in sylvis subtropicalis. Oaxaca, Huautla de Jiménez, prope. Puente de Fierro, Jacobs 27 (Typus ENCB).

Pileus 5-15 (-25) mm in diam., conic to subumbonate or campanulate, glabrous, even but translucent-striate when moist, lubricous, hygrophanous, dark chocolate brown fading to brownish yellow; bluing and readily blackening in old fresh specimens.

Lamellae subadnate, nearly white at first to dark brown violaceous, with whitish edges, very thin and fragile when dry.

Stipe 20-50 × 1-2 mm equal, flexuous, whitish to brown violaceous, fibrillose, floccose towards the base.

Veil inconspicuous except for some floccose fibrils on the stipe.

Context thin, pliant, concolorous with pileus, turning blue, and blackish when old. Odor and taste subfarinaceous.

Spore print dark violaceous brown.

Spores (4.9-) 5.5-6 (-7.1) × (4.4-) 5-5.5 (-7) × 3.5-4.5 µm, rhomboid in face view, subellipsoid in side view, thick walled (more or less 1 µm thick), dark yellowish brown, with a broad germ pore, and a short basal apiculus.

Basidia 10-15 × 4-6 µm, 4-spored, hyaline, ventricose or subcylindric.

Pleurocystidia 16.5-24 × 7.7-12 µm, very abundant, hyaline to brownish or brown, some become blue (in KOH solution), fusoid-ventricose, mucronate or with a short neck, 2.2-4.4 µm diam.

Cheilocystidia 16-21 × 5-6 µm, brown or orangish-brown, a few are hyaline, more or less abundant but not forming a sterile band, sublageniform or lageniform, neck flexuous, 2-2.5 µm diam., some necks are bifurcate.

Subhymenium as subparenchymatous layer, hyaline or sometimes with incrustated brownish pigment; frequently blue in KOH solution. Trama parallel, strongly and irregularly incrustated with orangish-brown pigment; hyphae up to 13 µm diam., thick (1.5 µm) walled. Epicutis a thin, subgelatinized and inconspicuous hyaline layer. Hypodermium subcellular and some elongated elements, strongly incrustated like the trama. Clamp connections present.

HABITAT AND DISTRIBUTION. Gregarious or scattered on soil or on humus, frequently on muddy soil, in coffee plantations or subtropical (deciduous) forests, at 1200-1800 m elevation. Fruiting in July. Known only from the State of Oaxaca (Mexico).

STUDIED MATERIAL. MEXICO, State of Oaxaca, Huautla de Jiménez region, Pollock 7/26/78-2-A (ENCB); Puente de Fierro, Jacobs 27 (Type ENCB; Isotype NY); Morlan 42-76 (ENCB).

DISCUSSION. The brown cheilocystidia relate this species to *P. weldenii* Guzmán, but in that species the cheilocystidia are more frequently hyaline than brown, and when brown they are 18-35 µm long, and *P. weldenii* is known only a tropical forest at 100 m elevation.

The name means the very abundant pleurocystidia in this species.

6. *Psilocybe rzedowski* Guzmán *Nova Hedwigia* 29: 645, 1978.

Figs. 23-26

Pileus 8-14 mm diam., conic to subcampanulate, subumbonate, glabrous, even but slightly striate at the margin, subviscid, hygrophanous, reddish brown to grayish yellow or grayish brown.

Lamellae adnate to adnexed, brownish to brown violaceous, with subfloccose whitish edges.

Stipe 30-35 × 1-1.5 mm, equal, hollow, whitish to brownish, covered by whitish fibrils; staining greenish blue to dark blue when touch, almost black toward the base when dry.

Veil apparently very weakly developed in mature specimens.

Context thin, pliant and whitish in the pileus, tough in the stipe. Odor and taste slightly farinaceous.

Spores (5-) 6-7.1 (-8.2) × 4.9-6 × 3.3-4.4 µm, regular or irregularly rhomboid or subrhomboid in face view to subellipsoid in side view, with a visible basal appendage and a broad germ pore, thick walled, dark yellowish brown.

Basidia 10-16.5 × 5.5-7.7 µm, 4-spored, hyaline, ventricose, some with a median constriction.

Pleurocystidia 16-22 × 5.5-8.8 µm, brownish to hyaline, abundant, fusoid ventricose or ventricose-substrate or slightly mucronate.

Cheilocystidia (14-) 16.5-22 × 5.5-7 µm, abundant, hyaline, ventricose-rostrate, with a more or less elongated neck, sometimes with a hyaline crystalline mass at the apex.

Subhymenium cellular, with yellow-brown pigment incrustated on the walls. Trama parallel, yellowish to hyaline, with thick (2 µm) walled hyphae, up to 16 µm diameter. Epicutis a subgelatinous layer, with parallel ochraceous narrow hyphae, up to 4 µm diameter. Hypodermium with pigmented hyphae, incrustated like those of the subhymenium, up to 10 µm diameter. Clamp connections present.

HABITAT AND DISTRIBUTION. In small groups on humus of the deciduous (*Liquidambar-Quercus*) forest; at 1000-1700 m elevation. Fruiting in July. Known only from subtropical forests of Mexico.

STUDIED MATERIAL. MEXICO. State of Veracruz, Municipio de Jalacingo, Ocotepec, *Ventura 1493* (Type, ENCB; Isotype NY). State of Oaxaca, near Ayautla, Finca Carlota, *Jacobs 50* (ENCB).

DISCUSSION. The non polymorphous cheilocystidia easily separate this species from *P. uxpanapensis* Guzmán and *P. brunneocystidiata* Guzmán & Horak which have polymorphous cheilocystidia. *P. rzedowskii* very probably is an hallucinogenic mushroom because it turns blue and has the odor and taste of the hallucinogenic species. The specimen from the State of Oaxaca is a new record. Guzmán (1978c) reported only this species from the type locality.

The species is named in honor of Dr. J. Rzedowski, a Mexican botanist who helped the author in the study of the vegetation, as well as in several nomenclatural problems.

7. *Psilocybe singeri* Guzmán *Beih. Sydowia* 8: 173, 1979.

Figs. 45-54

Pileus (8-) 15-20 (-40) μ m in diam., conic to convex, then campanulate, umbonate or with a short papilla, becoming somewhat plane or slightly depressed at the center, sometimes remaining papillate, occasionally irregularly lobulated, lubricous, even and glabrous, margin slightly translucent-striate when moist, hygrophanous, purpuraceous brown, chocolate brown, dark reddish brown, or orangish brown, fading to grayish olivaceous brown, yellowish brown, dirty pinkish brown, or very irregularly straw color. Turning irregularly blue when touched mainly in young stages.

Lamellae subadnate or sinuate-adnate, pale yellowish brown at first, then purpuraceous brown. With whitish and subfloccose edges when mature.

Stipe (20-) 30-60 (-90) $\times$ (1.5-) 2-3 (-5) mm, equal or frequently irregular in diameter or somewhat plane, subbulbous, flexuous or sinuous, irregularly twisted, cartilaginous or pliant, hollow to stuffed with a white cottony pith. Surface whitish to reddish brown when mature, more or less smooth above to floccose below, finely coated or mottled by white appressed fibrils mostly toward the base; frequently with a greenish or olive tone. Staining deep blue where injured. Frequently with a irregular pseudorhiza 3/4 the total length, covered by the soil or humus.

Veil rudimentary, arachnoid, white and inconspicuous, soon evanescent, not forming an annulus.

Context pliant, concolorous with the pileus or somewhat paler or whitish in young stages, but reddish brown or orangish brown in the stipe. Staining blue mainly in the pileus when cut in young specimens. Odor and taste strongly farinaceous in young specimens to slight farinaceous in the old. KOH stains the pileus and context reddish brown, but is negative on the stipe. When dry the old carpophores remain completely black.

Spore print dark purple brown.

Spores (3.8-) 4.9-5.5 (-7.7) $\times$ 4.4-5 (-5.5) $\times$ 3.3-4.4 μ m, rhomboid or subrhomboid in face view, subellipsoid in side view, thick walled, yellowish brown, with a broad germ pore. Some spores are abnormal, with two germ pores and others are asymmetric (two spores joined from the hilar appendage).

Basidia 16.5-24 $\times$ 4.4-5.5 μ m, 4-spored, hyaline, subcylindric, with a median slight constriction.

Pleurocystidia 17.6-33 $\times$ 5.5-9.9 μ m, both hyaline and brown, very numerous, variable in form, fusoid-ventricose or mucronate, or moniliform, or sublageniform with short or long neck 3.5-4.4 μ m broad, simple or bifurcate. The brown pleurocystidia readily stain blue with cotton blue.

Cheilocystidia hyaline, of two types, 16.5-22 $\times$ 4.4-5.5 μ m or 22-27.5 $\times$ 6.6-8.8 μ m; the first that are the most common, lageniform, with long neck 1.1-2.2 μ m broad, sometimes irregularly branched or bifurcated and with an amorphous hyaline mass at the top. The large cheilocystidia which are more or less common close the sides of the gill are very irregular in form, ventricose strangulated or moniliform, sometimes irregularly branched.

Subhymenium subcellular, formed by irregular and globose element with brown or brownish pigment irregularly incrusting the hyaline walls which often breaks up. Trama regular, hyaline, or irregularly incrustated like the hyphae of the subhymenium; hyphae up to 17 μ m diam., and the walls 2-4 μ m thick (the gills are more or less cartilaginous in KOH). Epicutis a subgelatinized layer, with more or less hyaline to brownish parallel hyphae. Hypodermium brownish to hyaline, with elongated to more or less globose hyphae up to 15 μ m diam. Clamp connections present.

HABITAT AND DISTRIBUTION. Solitary or more commonly gregarious on clay soil or humus, common near trails mainly in virgin tropical rain forests. Rare in secondary vegetation (*acahuales*). Also rare in coffee plantations; grows between 100 to 900 m elevation. Fruiting in summer. See under *P. uxpanapensis* Guzmán for more information on habitat.

STUDIED MATERIAL. MEXICO, State of Veracruz, Region of Uxpanapa, La Laguna to Camp Uxpanapa, *Guzmán 15807* (Type ENCB; Isotype in MICH & NY). South of Poblado 2, Brecha X-66, *Guzmán 15783; 15988; 15996; 16018; 16028; 17496; 17497; 17495; 17597 & 17598* (all in ENCB). State of Oaxaca, Region of Huautla de Jiménez, *Jacobs 57* (ENCB).

DISCUSSION. A tropical species close to *P. uxpanapensis* Guzmán, *P. weldenii* Guzmán and *P. veraecrucis* Guzmán of which the last is the most closely related because of the polymorphous cheilocystidia, but differs in the absent of pseudorhiza and more larger spores. Because it turns blue, as well as for its taste and flavor, this species surely has hallucinogenic properties, but no studies have yet been made. This species, with the other related tropical Mexican species has very important relationships with the "mushroom stones" from the Mayan culture as Guzmán (1978c)

appointed. *P. singeri* and related species are the first tropical hallucinogenic species from the Mexican tropics, and although Uxpanapa region is not exactly in the Maya zone, it is very close to it and belongs to the same ecological region. Palenque, a very important archaeological Maya city very close to the Uxpanapa region, has a vegetation and weather patters similar to those areas where *P. singeri* is found. It is probably *P. singeri* and related species are found there in Palenque zone.

This species is named in honor of Dr. Rolf Singer for his valuable work in the Agaricales, even in Mexico.

P. singeriana Guzmán is an independent species belongs to Sect. *Singerianae*, as will be discuss below.

Selected illustrations. Guzmán *et al.* (1979, Fig. 3).

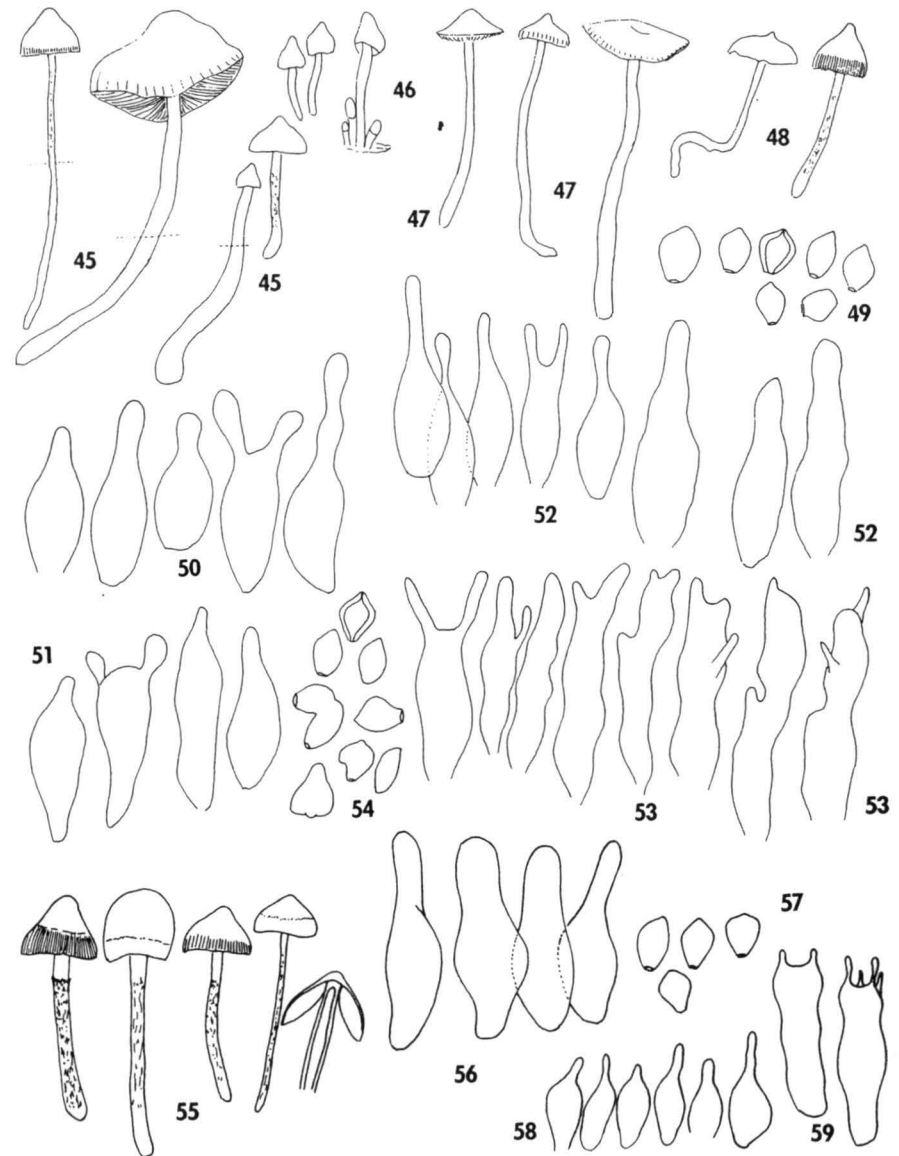


Plate 13: Figs. 45-59. - Several species of *Psilocybe*. 45-54: *P. singerii*, 45-48: Carpophores, 49: Spores, 50 & 51: Pleurocystidia, 52 & 53: Cheilocystidia, 54: Spores (45: Guzmán 17495; 46: Guzmán 17496; 47: type; 48: Guzmán 15988; 50 & 52: Type; 51-54: Guzmán 16028). 55-59: *P. brasiliensis*, 55: Carpophores, 56: Pleurocystidia, 57: Spores, 58: Cheilocystidia, 59: Basidia (all from the type).

8. *Psilocybe uxpanapensis* Guzmán *Beih. Sydowia* 8: 170, 1979. Figs. 36-39 & 664

Pileus 19-30 mm in diam., conic to subconvex or subumbonate, shortly papillate, sometimes becoming plane or depressed at the disc, even and glabrous, finely marked with translucent striations when moist, lubricous or subviscid, hygrophanous, reddish brown or chocolate brown to pale ochre, but blackish when old; when young staining blue where injured.

Lamellae adnate, or adnexed or sinuate, brownish violet to blackish violet, with whitish floccose edges.

Stipe 40-90 × 1-3 mm, equal but sinuous and flexuous, hollow, reddish brown or brownish, fading to blackish, densely fibrillose floccose from whitish appressed fibrils. Turning blue when cut or injured.

Veil whitish, arachnoid and inconspicuous, soon evanescent, not forming an annulus.

Context pliant or fleshy, whitish to brownish, darker on the stipe. Odor and taste slightly farinaceous. Turning blue when cut. KOH stains the pileus and the stipe deep orange brown, but slightly so in the context.

Spore (4.9-) 5.5-6.6 (-7.7) × 4.4-5.5 (-6) × 3.5-4.4 μm, subrhomboid or rhomboid in face view, subellipsoid in side view, thick walled, yellowish brown and with a distinct germ pore.

Basidia 12-30 × 5.5-6.6 μm, 4-spored, hyaline, subcylindric or subpyriform, with a slight median constriction.

Pleurocystidia 22-30.8 × 6.6-11 μm, brown to hyaline, with homogeneous content, easily colored with cotton blue; fusoid-ventricose or sublageniform with a short neck 3.3-4.4 μm diam., sometimes irregularly branched.

Cheilocystidia 19.8-38.5 × 5.5-8.8 μm, very numerous, forming a broad sterile band, hyaline, polymorphous, ventricose substrangulate, submoniliform, subclaviform, or fusoid-ventricose-capitate, with round tips or heads, 4.4-5.5 μm broad.

Subhymenium subcellular, with globose elements yellowish brown, irregularly incrustated on the thick walls, which often break up. Trama regular with hyphae like those of the subhymenium, walls 2.5 μm thick. Epicutis a more or less gelatinized thin layer of hyaline to brownish hyphae, parallel to the surface. Hypodermium of compact hyaline or brownish hyphae elongated to somewhat globose, 3-16 μm diam. Clamp connections more or less frequent in all the hyphae.

HABITAT AND DISTRIBUTION. Solitary or gregarious on soil on or near trails in tropical virgin rain forests. Known only from Mexico (Uxpanapa region). A study of the soil in the type locality (the same of *P. weldenii* Guzmán) shows that the soil is argillaceous orange brown when dry and dark brown when humid, with a pH 4.4 (see discussion in the Chapter of Ecology). This species as well as *P. weldenii* Guzmán, *P. singeri* Guzmán and *P. veraecrucis* Guzmán, grows only in places without or with little herbaceous plants; it seems, as with *P. caeruleascens* Murr. and *P. zapotecorum*

Heim emend. Guzmán, that these fungi apparently can not compete with other organisms, probably for nutritional reasons.

Unfortunately these fungi from the tropical virgin rain forests are almost lost. This vegetation is almost destroyed throughout all Mexico. The original very interesting tall jungle vegetation of the type locality, known by the author with Dr. A.L. Welden in 1976, was completely lost in 1978. This area is now a subagricultural land or meadows.

STUDIED MATERIAL. MEXICO, State of Veracruz, Region of Uxpanapa, near Uxpanapa Camp, *Guzmán 15956* (Type ENCB; Isotype in MICH). South of Poblado 2, Brecha X-66, *Guzmán 15760; 15764 & 16023* (all in ENCB).

DISCUSSION. A species closely related to *P. singeri* Guzmán, *P. weldenii* Guzmán and *P. veraecrucis* Guzmán & Pérez-Ortiz (see discussion of *P. singeri*). The name of the species is taken from the type locality name.

SELECTED ILLUSTRATIONS. Guzmán *et al.* (1979, Fig. 6, as 5 by mistake).

9. *Psilocybe veraecrucis* Guzmán & Pérez-Ortiz *Nova Hedwigia* 29: 646, 1978. Figs. 40-44 & 709

Pileus (5-) 10-20 mm in diam., conic to subumbonate, becoming somewhat plane, but with a small papilla, subviscid to dry, even and glabrous, but slightly striate at the margin when moist, hygrophanous, reddish brown or grayish brown to brownish, sometimes with olive tones, darker or blackish when fading in old specimens.

Lamellae adnate to adnexed, purpuraceous brown to dark violet brown, with whitish subfloccose edges.

Stipe 30-45 × (0.5-) 1-2 mm, equal or slightly attenuate at the apex, hollow, whitish at first, then brownish reddish dark, fibrillose-floccose from white appressed fibrils mainly toward the apex. Staining blue when injured.

Veil inconspicuous except for the floccose scales on the stipe. No annulus formed.

Context pliant, thin and whitish in the pileus, reddish brown and fibrous in the stipe. Odor and flavor slightly to strongly farinaceous. Staining blue when injured or cut.

Spores (4.9-) 6-7 (-9.9) × 4.4-6 (-6.6) × 3.3-4.4 μm, regular or irregularly rhomboid in face view, subellipsoid in side view, thick walled, yellowish brown, with a broad germ pore, and a short basal appendage.

Basidia 15-22 × 5-6.5 μm, 4-spored, hyaline, ventricose-cylindric, with a slight median or superior constriction.

Pleurocystidia 22.5-30 (-44) × 8.8-11 (-16.5) μm, brownish, rarely hyaline, abundant, fusoid ventricose with acute apices, sometimes irregularly branched.

Cheilocystidia 22-27.5 × 6.6-11 µm, abundant, forming a sterile band, hyaline, polymorphous, mostly resembling the pleurocystidia in shape, but some are ampullaceous or lageniform, with long necks 1-2.5 µm broad, simple or irregularly branched.

Subhymenium yellowish, subcellular, formed with globose elements, irregularly incrustated with yellow brown pigment here and there. Trama regular, hyaline or yellowish, with parallel hyphae up to 27 µm in diam. and with thick walls, 1.5 µm thick, irregularly incrustated. Epicutis of subgelatinized, hyaline to brownish, hyphae, narrow and parallel in arrangement. Hypodermium with elongated elements, 6-15 µm diam., similar those of the trama. Clamp connections present.

HABITAT AND DISTRIBUTION. Solitary or in small groups on soil in a coffee plantation remainder of a tropical rain forest, at 40 m elevation. Fruiting in July-August. Known only from the type locality.

STUDIED MATERIAL. MEXICO, State of Veracruz, road Minatitlán to Jaltipan, northeast of Cosoleacaque, near the Cementary, *Pérez-Ortiz 307* (Type ENCB; Isotype NY); *Guzmán 17433-A* (ENCB).

DISCUSSION. This species is close to *P. singeri* Guzmán and *P. uxpanapensis* Guzmán, but differs in the size of the spores and in the form of the cheilocystidia. It is probably hallucinogenic fungus but no study has been made on their chemistry of these species.

10. *Psilocybe weldenii* Guzmán *Beih. Sydowia* 8: 175, 1979. Figs. 31-35, 676 & 714

Pileus (5-) 10-20 (-25) mm in diam., conic to convex, then umbonate to short papillate, becoming somewhat plane, glabrous, even or somewhat rimose, slightly striate at margin when moist or even when dry, lubricous to dry, hygrophanous, reddish brown or chocolate brownish, fading to ochraceous or pale yellowish brown over the disc; staining blue when cut or injured.

Lamellae adnate to sinuate or adnexed, brownish violet to darker violet brown, with whitish subfloccose edges.

Stipe 40-60 × 1-2 (-3) mm, equal, somewhat bulbous, sinuous, hollow, smooth or covered or mottled by appressed to more or less loose white fibrils, mainly toward the apex; surface whitish that soon changing to brown reddish when mature. Turning blue when injured or cut.

Veil white, arachnoid, poorly developed, no annulus formed.

Context whitish or brownish, thin, pliant and translucent in pileus, reddish brownish and fibrous in the stipe. Odor and taste slightly farinaceous. Staining blue when exposed to air or injured. KOH stains the pileus orange brown, and the stipe and context brownish.

Spores (4.4-) 5.5-6.6 (-7.7) × (3.8-) 4.9-5.5 (-6) × 3.3-4.4 µm, subrhomboid or rhomboid in face view, subellipsoid in side view, yellowish brown, thick walled, with a broad germ pore, frequently abnormal spores are present, with two germ pore.

Basidia 12-19 × 6-7 µm, 4-spored, hyaline, subcylindric or ventricose, with a median constriction.

Pleurocystidia 18-35 × 5.5-17.6 µm, both hyaline and brown, more commonly hyaline, ventricose fusoid to submucronate with or without a short neck and obtuse or capitate tip, 3.3-5.5 µm diam. The brown cystidia are easily stained blue with cotton blue.

Cheilocystidia abundant, forming a sterile band, of two types, one type similar to the brown pleurocystidia in form and size; the hyaline ones that are the most common, 15-21 × 5.5-6.6 µm, lageniform with long necks 1-2 µm broad, simple or branched.

Subhymenium subhyaline or yellowish, subcellular, with thin to thick walled globose elements, somewhat incrustated. Trama regular, with yellowish brown pigment incrustated irregularly on the walls of the hyphae, the walls are 2-3 µm thick, and the hyphae are up to 20 µm diam. Epicutis formed by a subgelatinized, hyaline to brownish hyphae, more or less parallel to the surface. Hypodermium hyaline or brownish, with elongated incrustated hyphae, up to 6 µm diam. Clamp connections observed in all the hyphae.

HABITAT AND DISTRIBUTION. Solitary or more rarely scattered in soil or humus, on or near trails, mainly in virgin tropical rain forests, rare in coffee plantations. Fruiting between June-August. Known only from the States of Oaxaca and Veracruz (in Mexico). For more information on the habitat see under *P. uxpanapensis*.

STUDIED MATERIAL. MEXICO, State of Oaxaca, Jalapa de Díaz to Ayautla, *Jacobs 40* (ENCB). State of Veracruz, Region of Uxpanapa, near Camp Uxpanapa, *Guzmán 15897* (Type ENCB; Isotype MICH). South of Poblado 2, Brecha X-66, *Guzmán 15990; 16048 & 17490* (ENCB).

DISCUSSION. *P. weldenii* is closely related *P. pleurocystidiosa* Guzmán, but differs to having more hyaline cheilocystidia than brown one and in the size of these. The latter species is known only from subtropical forests. It is very probably that *P. weldenii* is an hallucinogenic fungus (see discussion of *P. singeri*).

This species is named in honor of Dr. Arthur L. Welden, a North American mycologist who studies tropical Mexican fungi and has helped to the author to collected the type.

Section *Blattariopsidae* Guzmán, Sect. nov.

Pleurocystidiis brunneous. Sporis crassae tunicatis, subhexagonalis. Typus: *P. blattariopsis* (Speg.) Sing.

Pleurocystidia brown. Spores subhexagonal in the face view and thick walled. Only one species is known in this section. Future studies are necessary to establish the correct position of *P. blattariopsis* (Speg.) Sing., since the type material is too poor to allow a complete study.

11. *Psilocybe blattariopsis* (Speg.) Sing. *Lilloa* 23: 214, 1950.

Pholiotella blattariopsis Speg., *Bol. Acad. Nac. Cienc. Córdoba* 11: 413, 1889.

Conocybe blattariopsis (Speg.) Rogers, *Mycologia* 45: 318, 1953.

Figs. 188-190

Pileus about 15 mm in diam., convex to campanulate, subumbonate, glabrous, even or slightly squamulose, somewhat striate at the margin, yellow-brown with the center darker, probably hygrophanous.

Lamellae adnate, violaceous chocolate brown, not fimbriate edges.

Stipe about 35 × 3 mm, equal but subbulbose at the base, hollow, whitish to straw color with some greenish tints, more or less smooth.

Veil well developed, forming a thick membranous white, and permanent annulus.

Context of the pileus and stipe whitish sometimes with dark greenish shades.

Spores (8.4-) 9.6-10.8 (-13.2) × (6.6-) 7.2-9.6 (-10) × 5.5-7.2 μm, subhexagonal in face view, ellipsoid or subellipsoid in side view, with thick wall (more or less 1.5 μm thick), yellow brown, with flattened and broad germ pore and short hilar basal appendage.

Basidia 12-19 × 6-9 μm, 4-spored, pyriform, hyaline, with sterigmata up to 5 μm long.

Pleurocystidia difficult to study, they are collapsed, but some are 18-30 × 6-10 μm, yellow brown, ventricose to subpyriforme.

Cheilocystidia not observed.

Trama subparallel, with subhyaline or brownish hyphae. Epicutis formed by a thin layer of parallel or interwoven subgelatinous and brownish hyphae. Hypodermium with hyaline or pigmented (brownish), hyphae, 7-12 μm diameter. Clamp connections present.

HABITAT AND DISTRIBUTION. On soil, solitary, in subtropical vegetation. Known only from the type locality. Fruiting in August.

STUDIED MATERIAL. BRAZIL, Ahiyahy, *Puiggari 1535* (LPD 13, 333 Type).

DISCUSSION. This species is similar to those of the Section *Merdariae*, for the annulus and subhexagonal thick walled spores, but the brown cystidia strongly distinguishes it. Unfortunately the type (the only material studied), is not in good condition, and it is difficult to make a careful study of the hymenium. Singer (1950) examined it, and commented: "cystidia possibly present (part of the hymenium is now destroyed) but certainly not of the gloeocystidia type (chrysocystidia) as found in *Naematoloma*; cheilocystidia now mostly collapsed, hyaline" Spegazzini (1889) described the fungus in the genus *Pholiotella*, but Singer (*op. cit.*) considers this a synonym of *Psilocybe*. The position of this taxon in *Conocybe* Fayod (Rogers, 1953) is objectionable.

The name of the species probably means moth, from de Latin *blatta*.

Section *Subaeruginosae* Guzmán, Sect. nov.

Pleurocystidiis et cheilocystidiis brunneous vel brunneolus, infrequens hyalinae. Sporae subellipticae plus 10 μ m longus. Species in regio temperato. Typus *P. subaeruginosa* Clel.

Pleurocystidia and cheilocystidia brown or brownish, very rarely hyaline. Spores subellipsoid, more than 10 μ m long. Only two species are known, both in temperate zones. It is probable that this section is a complex of at least two sections, one bluing and the other non bluing.

Only two species in the Section: 12. *P. paupera* Sing. and 13. *P. subaeruginosa* Clel.

Key to the species

- 1a. Not turning blue. Cheilocystidia and pleurocystidia pale brownish to somewhat hyaline. Spores 12.7-15.5 (-20) $\times$ 6.7-9 μ m. Known only from southern of Brazil (Rio Grande do Sul) and possibly from Europe. 12. *P. paupera*
- 1b. Bluing species. Cheilocystidia and pleurocystidia chocolate brown, some are hyaline. Spores (10-) 13.2-14.3 (-15.4) $\times$ 6.6-7.7 μ m. Known only from Australia and Tasmania. 13. *P. subaeruginosa*

12. *Psilocybe paupera* Sing. *Sydowia* 9: 904, 1955.

Figs. 191-194

Psilocybe uda (Pers. ex Fr.) Gill. *sensu* Sing., *Lilloa* 24: 143, 1953.

P. uda ss. Ricken, *sensu* Moser, *Kleine Krypt.* II, b/2, p. 238, 1967. non *P. uda* (Pers. ex Fr.) Gill., *Champ. Fr.* p. 586, 1878 = *Naematoloma udum* (Pers. ex Fr.) Karst., *Bidr. Finl. Nat. Folk.* 32: 497, 1879.

Pileus 20-25 mm in diam., convex to obtusely umbonate, glabrous, even but slightly striate at the margin or not at all, not viscid, slightly hygrophanous, rusty color to light yellow, fading to orangish brown.

Lamellae adnexed, yellow, then umber, somewhat dusted by the spores, becoming "caucasia" to yellowish brown, with not pallid edge.

Stipe 60-70 $\times$ 1.5-2.5 mm, subequal or somewhat thickened at the apex, to subfiliform, deeply-rooted in the substratum, grayish white to rusty ochre brown, with coarse fibers which are pale tan colored and especially at the apex, eventually entirely glabrescent.

Veil very cortinate, fugacious, at least in the mature specimens there are not annulus.

Context yellowish, almost unchanging. Taste nearly mild. Odor faintly astringent, but weak.

Spores 12.7-19.5 (-20) $\times$ 6.7-9 μ m, subellipsoid both in face and side view, thick walled, yellowish brown, with an apical germ pore not distinctly truncate.

Basidia 26-32 $\times$ 6.6-9.7 μ m, hyaline or sometimes yellowish, ventricose with a slight median constriction, normally 4-spored, but 1-, 2- and 3-spored basidia are also present, these having strongly elongated sterigmata 8-15 μ m long.

Pleurocystidia 20-30 $\times$ 6.6-8.8 μ m, abundant, hyaline, or more commonly pale brownish, ventricose to fusoid-ventricose with one, two or three simple or branched elongated necks, 1-3 μ m broad. It seems that these pleurocystidia are modified basidia.

Cheilocystidia 22-37 $\times$ 7.7-13 μ m, hyaline or pale to dark brownish, ventricose, fusoid-ventricose or ampullaceous, mucronate or short necked or a capitate apices 2-5 μ m broad.

Subhymenium yellowish brown, with narrow hyphae no incrusted. Trama regular, brownish pigment diffused, with somewhat thick walled no so incrusted. Epicutis formed by repent hyphae, somewhat subgelatinized, hyaline to yellowish brown. Hypodermium with elongated to vesiculate thick walled hyphae, no so incrusted. Clamp connections common.

HABITAT AND DISTRIBUTION. Gregarious on *Sphagnum* (in *Sphagnetum*), attached to the thalli of the mosses. Fruiting in February. Known from Southern Brazil and possibly from Europe.

STUDIED MATERIAL. BRAZIL, Rio Grande do Sul, Taimbseinho, *Singer B-103* (BAFC Type).

DISCUSSION. This species is the same that *Naematoloma udum* (Pers. ex Fr.) Karst. *sensu* Ricken without chrysocystidia. Singer (1953) supposed that Ricken's and even Konrad & Maublanc's fungi had neither pleurocystidia neither chrysocystidia, then Singer thinks that *P. paupera* also grows in Europe as well as in Brazil. Bresinsky & Haas (1976) reported *P. paupera* from Germany. This is very interesting geographically disjunction, because southern Brazil is quite isolated from any northern area. Singer's descriptions (1953; 1955) did not include any pleurocystidia, but the type of *P. paupera* has very conspicuous pleurocystidia as previously described. The pale brownish pleurocystidia and cheilocystidia (also not reported by Singer), connects this species with *P. subaeruginosa* Clel. in the Section *Subaeruginosae*. It is very probably that these two species belong to two different sections, because of the bluing feature. Moser (1967) following Singer considered Ricken's fungus as *Psilocybe*.

The name of the species means "poor", probably in reference to the lack of knowledge on this species and the small carpophore.

13. *Psilocybe subaeruginosa* Clel. *Trans. & Proc. Roy. Soc. South Australia* 51: 305, 1927. Figs. 195-202

Pileus 18-50 mm in diam., conic to convex or expanded-umbonate; the umbo small and acute, surface glabrous, even, but the margin slightly striate, hygrophanous,

pale brownish to dark brown when older, often with bluish-green tints, drying pallid brownish or cream color.

Lamellae adnate to adnexed, sometimes or in old specimens with lines extending down the stipe. Pallid smoky-brown becoming brownish-fuscon or dark violet chocolate, edges not whitish.

Stipe 50-125 × 2-5 mm, equal, or slightly attenuated upwards, finely striate, mealy above, fine fibrils sometimes adherent below, base a slightly swollen and passing sometimes into a broad mass of white mycelium, stuffed but sometimes hollow, cartilaginous. Surface whitish, streaked with dark greyish-brown, often blotched greenish-blue.

Veil a whitish cobweb in young stages, occasionally leaving indefinite traces as a somewhat superior annulus.

Context white to whitish in the pileus and stipe, but becoming brownish in the stipe. Turning blue when bruised or on drying.

Spore print purplish-fuscon.

Spores (10-) 13.2-14.3 (-15.4) (-16.5 very rare) × 6.6-7.7 (-9.3 very rare) × 6-7.5 μm, subellipsoid both in side or face view, thick walled, pale to dark yellowish brown, with more or less broad germ pore.

Basidia 24-33 × 6.6-11 μm, 4-spored or rarely 2-spored, hyaline, or yellowish-brown, ventricose or subcylindric to subpyriform.

Pleurocystidia 22-47.3 × 6-16.5 μm, fusoid-ventricose, subpyriform, mucronate or with a more or less elongated neck 2-4.5 μm broad, chocolate brown, some yellowish brown; very rarely hyaline.

Cheilocystidia 17-29 × 5.5-11 μm, similar to the pleurocystidia in form and color, abundant, sometimes forming a sterile band, frequently with a hyaline drop at the apex.

Subhymenium subcellular, hyaline to brownish with diffused to irregularly incrustated pigment on the thick walls, sometimes diffused blue pigment is observed in KOH slides. Trama parallel, hyaline or brownish, with thick walled hyphae (walls 1-1.5 μm thick). Epicutis formed by a gelatinized thin layer of elongated hyphae, more or less 5 μm diam, hyaline to brownish. Hypodermium hyaline to brownish, formed by subglobose to elongated hyphae, walled cells. Clamp connections very common and conspicuous.

HABITAT AND DISTRIBUTION. Solitary to gregarious, on rich soil among grass or horse dung, or on decaying leaves and twigs, mainly in deeply shaded places. Fruiting in April-August. Known only from Australasia.

STUDIED MATERIAL. AUSTRALIA, Near Adelaide, Mount Lofty, *Cleland 13251* (Type AD).

TASMANIA, Mount Field National Park, pathside to Russell Falls, *Watling 10336 & 10387* (E).

DISCUSSION. The brown pleurocystidia and cheilocystidia relates this species to those of the Section *Brunneocystidiatae* but those species have small rhomboid or subrhomboid spores, Cleland's species in apparently endemic to the Australian mainland and Tasmania. Cleland (1927, 1934-1935) recorded *P. subaeruginosa* from South Australia, New South Wales and Victoria. Willis (1963), Hall (1973) and Southcott (1974) reported *P. subaeruginosa* from Australia and Tasmania, but these records have not been confirmed by the author and may actually represent some other bluing species as *P. eucalypta* Guzmán & Watling, *P. australiana* Guzmán & Watling and *P. tasmania* Guzmán & Watling, reported by Guzmán & Watling (1978).

This fungus should not be confused with *P. subaeruginascens* Höhn., which belongs to the Section *Stunzae*. *P. subaeruginosa* as the bluing species is an hallucinogenic fungus (Hall, 1973; Southcott, 1974). Further, Picker & Richard (1970) have studied the psychotomimetic agents in *P. subaeruginosa*, but no voucher material can be located by Watling to confirm the identification (Guzmán & Watling, 1978).

The name of the species refers to its similarities to *Stropharia aeruginosa* (Curt. ex Fr.) Quél., particularly for the blue-green tones of the pileus.

SELECTED ILLUSTRATION. Cleland (1934-1935, fig. 25), and with some reserves Willis (1963), Hall's (1973) and Southcott's (1974) figures.

Section *Cordisporae* Guzmán, sect. nov.

A Sectionae Mexicanae differt sporae rhomboideae vel subrhomboideae, exiguitae 8 μ m longae. Typus: *P. cordisporae* Heim.

This Section is very close to Sect. *Mexicanae*, but the spores are not more than 8 μ m long. Pleurocystidia are present, but not very conspicuous. Subhymenium and/or hypodermium usually has thick walled hyaline to yellow brown or orange brown incrustated pigmented hyphae. Most species if not all turn blue when injured. Common in tropical and subtropical forests.

Species considered: 14. *P. brasiliensis* Guzmán, 15. *P. caerulescens* Murr. var. *caerulescens*, 16. *P. caerulescens* var. *ombrophila* (Heim) Guzmán, 17. *P. columbiana* Guzmán, 18. *P. cordispora* Heim, 19. *P. dumontii* Sing. ex Guzmán, 20. *P. fagicola* Heim var. *agicola*, 21. *P. fagicola* var. *mesocystidiata* Guzmán, 22. *P. fuliginosa* (Murr.) Smith, 23. *P. furtadoana* Guzmán, 24. *P. goniospora* (B. & Br.) Sing., 25. *P. herrerae* Guzmán, 26. *P. hoogshagenii* Heim var. *hoogshagenii*, 27. *P. hoogshagenii* var. *convexa* Guzmán, 28. *P. jacobsi* Guzmán, 29. *P. lonchophorus* (B. & Br.) Horak ex Guzmán, 30. *P. mammillata* (Murr.) Smith, 31. *P. ochreatea* (B. & C.) Horak ex Guzmán, 32. *P. papuana* Guzmán & Horák, 33. *P. plutonia* (B. & Br.) Sacc., 34. *P. shultesii* Guzmán & Pollock, 35. *P. subyungensis* Guzmán, 36. *P. wassoniorum* Guzmán & Pollock, 37. *P. wrightii* Guzmán, 38. *P. xalapensis* Guzmán & López, and 39. *P. yungensis* Sing. & Smith.

Key to the species

- 1a. Pleurocystidia absent or rare. 2
- 1b. Pleurocystidia common. 12
- 2a. Cheilocystidia absent. Spores 7.5-8 μ m long. Species known only from Ceylon. 31. *P. ochreatea*
- 2b. Cheilocystidia present. 3
- 3a. Cheilocystidia generally more than 25 μ m long. 4
- 3b. Cheilocystidia not more than 25 μ m long. 5
- 4a. Cheilocystidia regular in form, (20-) 25-35 $\times$ 5-6 μ m. Spores (4.4-) 5.5-6.6 (-7.7) $\times$ 3.8-4.4 μ m. Pileus 7-10 mm diam. Species known only from Mexico. 18. *P. cordispora*
- 4b. Cheilocystidia very irregular in form (see 22b: *P. yungensis*) (see also 24a: *P. xalapensis* and 24b: *P. wassoniorum*).

- 5a. Habit typically collybioid. Pileus convex to expanding, more than 30 mm in diameter. Spores (6-) 6.7-8 (-8.5) μ m long. Cheilocystidia 15-22 (-25) μ m long. (see also 15b). 6
- 5b. Habit mycenoid. Pileus conic or subumbonate not expanding, not more than 30 mm in diameter. 7
- 6a. Sporophore robust. Pileus 30-70 (-100) mm in diameter. Stipe 8-10 (-12) mm thick. Habitat in sunny places. 15. *P. caerulescens* var. *caerulescens*
- 6b. Sporophore not robust. Pileus 15-40 (-50) mm in diameter. Stipe 2-5 (-8) mm thick. Habitat in preferably shade places 16. *P. caerulescens* var. *ombrophila*
- 7a. Stipe with a pseudorhiza. 8
- 7b. Stipe without pseudorhiza. 10
- 8a. Cheilocystidia large, more than 14 or 15 μ m long. 23
- 8b. Cheilocystidia small, not more than 14 or 15 μ m long. 9
- 9a. Cheilocystidia small, 6-13 $\times$ 2.5-3.3 μ m. Species known to occur only in a *Fagus* forest in Mexico (State of Hidalgo). 20. *P. fagicola* var. *agicola*
- 9b. Cheilocystidia 8.8-15 $\times$ 3.3-4.4 μ m. Known to occur in several subtropical forests of Mexico. 21. *P. fagicola* var. *mesocystidiata*
- 10a. Cheilocystidia always hyaline, uniform in shape. 25
(If the cheilocystidia are hyaline, and variable in shape, see 22b: *P. yungensis*).
- 10b. Cheilocystidia hyaline to brownish toward the base, 10-18 (-26) $\times$ 3.3-6 (-7.7) μ m. Spores (4.4-) 4.9-5.5 (-6) μ m long. 11
- 11a. Cheilocystidia polymorphous, fusoid, ventricose-rostrate, clavate, stragulate or mucronate. Species known to occur in Panama. 19. *P. dumontii*
- 11b. Cheilocystidia uniform in shape, bottle shaped or sublageniform. Species known to occur in south of Brazil. 23. *P. furtadoana*
- 12a. Cheilocystidia unknown (absent?). Pleurocystidia 25-30 $\times$ 10-12 μ m, ventricose and papillate. Spores 5-6 (-7) $\times$ 5-5.5 μ m. Species known only from Ceylon. 29. *P. lonchophorus*
- 12b. Cheilocystidia well developed. 13
- 13a. Species with an annulus. Pleurocystidia 16-22 $\times$ 7.7-9.9 μ m, ventricose-globose and mucronate. Cheilocystidia lageniform, 16.5-22 μ m long. Species known only from Mexico (State of Oaxaca). 28. *P. jacobsi*
- 13b. Species without an annulus. 14
- 14a. Cheilocystidia lageniform. 15
- 14b. Cheilocystidia irregular in form, or branched. 20

- 15a. Cheilocystidia small, not more than 14 μm long. Pileus 22-29 $\times$ 8.8-12 μm . Species known only from southern of Brazil. 14. *P. brasiliensis*
- 15b. Cheilocystidia large, more than 14 μm long. 16
- 16a. Pleurocystidia ventricose-rostrate, not more than 6.6 μm thick. Pileus 25-65 mm diam. Species known only from Argentina. 37. *P. wrightii*
- 16b. Pleurocystidia ventricose-mucronate, more than 6.6 μm diam. 17
- 17a. Pleurocystidia not more than 8.8 μm thick. Sporophore small, pileus not more than 16 mm diam. Species known only from Mexico (State of Veracruz) in a tropical *Quercus* forest. 34. *P. schultesii*
- 17b. Pleurocystidia more than 8.8 μm thick. 18
- 18a. On wood. Spores 5.5-6.6 (-7) $\times$ 4.9-5.5 (-6) μm . Species known only from Ceylon. Pileus subumbonate. 24. *P. goniospora*
- 18b. On soil. Spores (4.9-) 6.5-7.7 (-9.6) $\times$ (3.8-) 4.5-6 μm 19
- 19a. Pileus papillate, 10-25 mm diam. Habitat on damp or muddy clay soil, inside of subtropical forests, or in coffee plantations. Known from Mexico and Argentina. 26. *P. hoogsgagenii* var. *hoogsgagenii*
- 19b. Pileus convex to subumbonate, not papillate, 5-15 mm diam. Habitat on soil in grasslands. Known only from subtropical regions of Mexico. 27. *P. hoogsgagenii* var. *convexa*
- 20a. Cheilocystidia branched. 21
- 20b. Cheilocystidia not branched. 22
- 21a. Pleurocystidia 12-25 μm long, mostly fusoid-ventricose. Species known only from subtropical forests of Mexico. 25. *P. herrerae*
- 21b. Pleurocystidia 8.8-11 μm long, mostly sublageniform. Species known only from tropical forests of Venezuela. 35. *P. subyungensis*
- 22a. Cheilocystidia consistently fusoid mucronate or sublageniform. Pleurocystidia numerous, regularly or irregularly ventricose. Tropical species, growing mainly on soil, known to occur in Cuba, Venezuela and Brazil. 33. *P. plutonia*
- 22b. Cheilocystidia variable in form, ventricose, ventricose-ampullaceous, strangled, clavate, obclavate or ventricose-rostrate. Pleurocystidia scanty, regularly fusoid-ventricose. Subtropical species, growing mainly on wood, from Mexico to Bolivia. 39. *P. yungensis*
- 23a. Cheilocystidia 22-30 μm long. Spores (6.6-) 7.1-8 (-8.8) μm long. Species known only from the high mountains (or "páramos") or Colombia. 17. *P. columbiana*
- 23b. Cheilocystidia and spores no so longer as the above choice or at least, species known only from subtropical forests of Mexico. 24

- 24a. Spores 5.2-5.8 (-6.5) μm long. Cheilocystidia 14.9-16.9 μm long. 38. *P. xalapensis*
- 24b. Spores (6-) 6.6-7.7 (-8.5) μm long. Cheilocystidia 14-25 (-28) μm long. 36. *P. wassoniorum*
- 25a. Pileus conic to papillate. Cheilocystidia 12-17 $\times$ 4-5.5 μm . Species widespread in the subtropics of America (known to occur in Florida, Jamaica, Mexico and Bolivia). 30. *P. mammillata*
- 25b. Pileus hemispheric, not papillate. Cheilocystidia 16-28 (-33) $\times$ 4.4-6.6 μm . Species known only from Jamaica. 22. *P. fuliginosa*

14. *Psilocybe brasiliensis* Guzmán *Mycotaxon* 7: 234, 1978.

Figs. 55-59, 657, 705, 734 & 757

Pileus 12-30 mm in diam., conic to convex to subcampanulate, glabrous, even, but striate toward the margin when moist, lubricous, hygrophanous, reddish brown to brownish or alutaceous.

Lamellae adnate or subadnate, brownish to fuscous sepia, with whitish fimbriate edges.

Stipe 35-80 $\times$ 1-4 mm, cylindric, equal or rarely subbulbous, whitish to almost colorous with pileus, hollow, covered toward the base with whitish fibrils, sometimes with a rhizomorphic prolongation.

Veil cortinate, white, fugacious, but sometimes persistent on the upper part of the stipe as a white floccose subannular zone.

Context whitish and fleshy in pileus, reddish brown and fibrous-hard in the stipe; odor and taste farinaceous. Readily staining blue when injured, but only slightly so in the stipe. KOH stains all parts yellow-brown.

Spore print dark grayish violet.

Spores (5.6-) 6.6-7.1 (-7.7) $\times$ 4.9-5.5 (-6) $\times$ 4.2-5 μm , subrhomboid in frontal view or subellipsoid in side view, yellowish brown, thick walled, with a broad germ pore.

Basidia 18-27 $\times$ 6.6-8.4 μm , 4-spored, hyaline, subventricose, or subcylindric.

Pleurocystidia 22-29 $\times$ 8.8-12 μm , hyaline, ventricose, fusoid or sublageniform.

Cheilocystidia 9.6-13.2 $\times$ 4.8-7.2 μm , abundant, forming a sterile band, hyaline, lageniform.

Subhymenium formed by subglobose elements with a reddish brown, no so incrustated pigment, sometimes with gray blue pigment. Trama regular, hyaline or yellowish with elongated hyphae cells 4-10 μm diam., thin walled (wall 0.5-1 μm thick), with clamps. Epicutis a thin layer more or less gelatinized, with brownish,

parallel, narrow hyphae. Hypodermium hyaline or yellowish with parallel elongated hyphae 5-13 μm diam., thin walled.

HABITAT AND DISTRIBUTION. Gregarious on grassy soil (with *Axonopus compressus*) in a forest of *Araucaria brasiliana* and *Podocarpus*. Known only from the type locality. Fruiting in March.

STUDIED MATERIAL. BRAZIL, Parque forestal del Estado de Sao Paulo, 10-13 km eastern Campus de Jardim, near Rio Sapucaiguasu, 1500 m elevation, *Guzmán* 8920 (Type SP, Isotypes ENCB & NY); other collections from the same locality are *Guzmán* 8922 & 8929 (SP & ENCB).

DISCUSSION. *P. brasiliensis* is close to *P. wrightii* Guzmán, but the size of the cheilocystidia readily separates them. It is also close to *P. caerulescens*, but the presence of pleurocystidia, as well as the size of the cheilocystidia are good features by which to separate these species. The bluing reaction, as well as the odor and flavor probably indicate that this species has hallucinogenic properties.

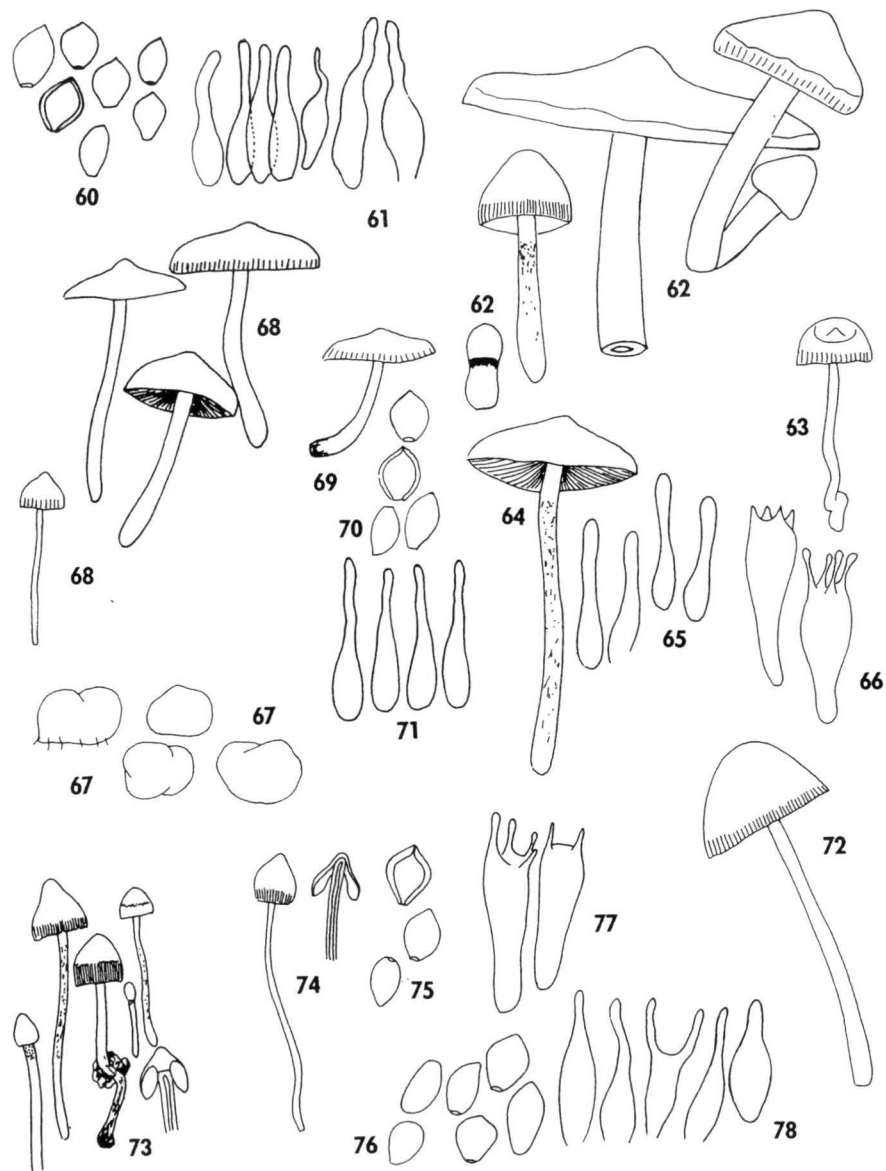
15. *Psilocybe caerulescens* Murr. Mycologia 15: 20, 1923 var. *caerulescens*
Figs. 60-67, 654, 658-662; 717 and plate 3

P. mazatecorum Heim, Comp. Rend. Acad. Sc. 242: 1392, 1956. nom. subnud.
P. caerulescens var. *mazatecorum* Heim, Rev. Myc. 22: 78, 1957.
P. caerulescens var. *mazatecorum* f. *heliophila* Heim, Champ. Halluc. Mex., p. 141, 1958, nom. subnud.
P. caerulescens var. *nigripes* Heim, Rev. Myc. 22: 79, 1957.
P. caerulescens ssp. *caerulescens* var. *albida* Heim, Rev. Myc. 37: 184, 1973.

Pileus (10-) 30-70 (-100) mm in diam., convex to subcampanulate, frequently umbonate, very rarely with a subpapillate umbo, becoming plane or shallowly depressed in age, thick, glabrous and even, lubricous or viscid from a separable gelatinous pellicle; margin slightly transparent when moist, but opaque when dry, hygrophanous, yellowish brown or reddish brown, with metallic luster, becoming paler towards the margin, dirty yellowish, straw color or beige when dry, readily turning blue when bruised or handled; the young specimens soon uniformly bluish to olivaceous or blackish.

Lamellae adnate to sinuate, whitish, yellowish gray or argillaceous when young to brownish violet or dark brown sepia at maturity, edges concolorous or slightly whitish.

Plate 14: Figs. 60-78. - Several species of *Psilocybe*. 60-67: *P. caerulescens* var. *caerulescens*, 60: Spores, 61: Cheilocystidia, 62-64: Carpophores, 65: Cheilocystidia, 66: Basidia; - 67: Sclerotia (60 & 61: type; 62: Guzmán 915; 64-66: Dumont; 63: Guzmán 1452; 67: Ott). 68-72: *P. caerulescens* var. *ombrophila*, 68 & 69: Carpophores, 70: Spores, 71: Cheilocystidia, 72: Carpophore (68: Guzmán 1877; 69-71: type of *P. mixaeensis*; 72: Guzmán GH-1107). 73-78: *P. columbiana*, 73 & 74: Carpophores, 75 & 76: Spores, 77: Basidia, 78: Cheilocystidia (73: type; 74 & 75 Guzmán 9145; 76-78: type).



Stipe (20-) 50-90 (-130) × (5-) 8-10 (-12) mm, equal or slightly thickened at the base, or sometimes irregularly cylindric, somewhat flexuous, hollow, subpruinose to floccose, whitish to irregularly brownish or blackish, readily turning blue when injured; basal mycelium whitish, occasionally with white rhizomorphs.

Veil well developed, cortinate and white, but not forming a true annulus, or at least no permanent, remaining as a floccose fibrils covering on the stipe and sometimes even on the margin of the pileus in young specimens.

Context whitish to pale brownish, plant and fleshy in the pileus, fibrous in the stipe, turning blue when cut or bruised or on drying. Odor and taste strongly farinaceous. KOH stains the pileus pale brownish red to blackish; the stipe pale brownish and the context brownish gray or reddish.

Spore print dark violaceous brown or deep purple fuscous.

Spores (6-) 6.7-8 (-8.5) × 5.2-6.5 × 3.3-5.2 μm, subrhomboid in face view, subellipsoid in side view, thick walled (1.5 μm), brownish yellow, with a broad germ pore at one end and a short appendage at the other; some spores are irregular in form (with a median constriction).

Basidia 12-24 × 6-7.5 μm, 4-spored, rarely 2-spored, hyaline, subventricose.

Pleurocystidia absent.

Cheilocystidia 15-22 (-25) × (3-) 4.4-6 μm, forming a sterile band, hyaline, fusoid, sublageniform or fusoid-ampullaceous, neck flexuous, 1-2.5 μm diam.

Subhymenium subcellular, formed by short globose cells, brownish to hyaline; sometimes latiferous yellowish hyphae are present. Trama parallel, with hyaline hyphae, 3-15 μm diam., thin walled. Epicutis formed by a subgelatinized layer of narrow, thin walled hyphae, 4-7 μm diam. Hypodermium hyaline, but with some brownish incrustations on the walls of the elongated to globose hyphal cells, thin walled, 6-15 μm diam. Clamp connections common.

HABITAT AND DISTRIBUTION. Gregarious or caespitose, rarely solitary, preferably in well lighted (sunny) places, on clay or muddy orange-brown soils, in zones where the soil has been recently removed or disturbed or tumbled down, without any herbaceous plants (the popular names of "derrumbes" or "desbarrancaderos" at Huautla de Jiménez region mean that this fungus grows in these kinds of habitats). Sometimes growing in sugar cane plantations, but never growing directly on mulch of sugar cane (contrary to the opinion of Heim & Wasson, 1958 and Singer & Smith, 1958b). Very rarely growing in meadows in between grasses and often close to *P. mexicana* and *P. hoogshagenii* var. *convexa*. Distributed from the southeastern U.S.A. (Alabama) to northern of South America (Venezuela). In Mexico it is very common in the subtropical or deciduous forest regions between 1200-1800 m of altitude (collection *Jacobs 56* was reported to be found at 300 m elevation, but it is necessary to verify this in order better understand the distribution of the species). Growing generally in the summer time, between June and August.

STUDIED MATERIAL. U.S.A., Alabama, Montgomery, *Burke* s.n. (NY, Type). MEXICO, State of Oaxaca, Huautla de Jiménez region, *Schultes* s.n. (jul. 27, 1938) (FH as *Deconica* sp.); *Wasson* s.n. (Aug. 14, 1953) (PC); *Wasson* s.n. (1956) (MICH as *P. mazatecorum*); *Wasson* s.n. (Jul. 1957) (MICH, NY); *Lowy* s.n. (Aug. 8, 1969) (NY); *Guzmán 1876 & 4143* (ENCB); *Heim* s.n. (Jul. 1956) (PC, Type of *P. caeruleus* var. *mazatecorum* f. *heliophila*); *Ott* s.n. (Jun. 1975 & Jul. 15, 1975) (ENCB); *Leslie 1911* (ENCB); *Jacobs 25* (ENCB); *Vargas 279* (ENCB); *Nava* (MEXU 5758; 5741; 5753); *Sabina* (MEXU 7476); *Herrera* (MEXU 5740, 7635); *Alvarez* (MEXU 5745); *Pollock 7-27-78-3; 7-27-78-4; 7-30-78-2 & 7-30-78-3* (ENCB); *Pastelin* (MEXU 4850 as *P. zapotecorum*, with the culture 109). Rancho El Cura (near Huautla de Jiménez), *Guzmán 915; 924; 925; 1452; 1457-A; 1528; 1903 & 2240* (ENCB but 924 & 1452 also in MICH); *Guzmán 967-B* (ENCB; MICH; LIL; K); *Singer M-1513* (MICH; K); *Nava* s.n. (Jul. 1960) (ENCB). Road to Ahuacatitla (Huautla de Jiménez region), *Morlan 38-76* (ENCB). Jalapa de Díaz to Ayutla, *Jacobs 46 & 56* (all in ENCB). Yaitepec, *Heim* s.n. (Jul. 1956) (PC, Type of *P. caeruleus* var. *nigripes*). San Agustín Loxicha region, *Guzmán 1126 & 1504-B* (ENCB). Chilapa (S of San Agustín Loxicha), *Guzmán 1501-B* (ENCB). Pluma Hidalgo region, Copalita, *Arroyo & Herrera* (MEXU 3940); Miahuatlán zone, near San Sebastian Rio Hondo, *Leslie 1524* (ENCB). State of Puebla, southeastern of Necaxa, *Guzmán 2114; 2116; 2118; 2119; 2170; 2323; 2324; 2325; 2656* (all in ENCB). State of Veracruz, near Xico, Xalapa zone, *Jacobs 68* (ENCB). Chiconquiaco region, Santa Rita; *Evans 25* (K, no vid). Cultures at Paris (from Oaxaca?), *Cailleux & Heim* (Nov. 27, 1959) (PC as *P. caeruleus* var. *nigripes*). Observed also from the State of Michoacan.

PANAMA, Prov. Veraguas, Atlantic slope, vicinity of Rio Calaviborita, Santa Fe to Calaviborita, *Dumont PA-570* (NY).

VENEZUELA. State of Sucre, Mundo Nuevo-Manacal road, northwestern of Irapa, *Dumont VE-4145* (NY).

DISCUSSION. *P. caeruleus* is an hallucinogenic mushroom which has a great variation in form and color of the fruit body. Heim (in Heim & Wasson, 1958 and Heim *et al.*, 1967) described three varieties and two forms, of which only one is considered here (see below). Heim first described this fungus as *P. mazatecorum* Heim, but after he receiving a letter from Smith (as discussed by Singer & Smith, 1958b), suggesting that this species agrees well with Murrill's species, Heim considered this a variety of *P. caeruleus*, based on the farinaceous taste and flavor, apparently absent in the type variety. Murrill (1923) wrote, based on the notes of the collector, "no characteristic taste", but it is true that sometimes the farinaceous odor and taste of *Psilocybe caeruleus* as in other species of this Section are very slight in the mature stages or in dry specimens.

P. caeruleus var. *nigripes* Heim was based on fruit bodies with the stipe whitish to blackish brown or almost black, which it is possible to see in the type at PC (*Heim*, Jul., 1956 from Yaitepec); the color plate by Heim (in Heim & Wasson, 1958) shows a fungus with the stipe white when immature to blue-black when

mature. But as has been generally observed in other collections of *P. caeruleus* and in several hallucinogenic species of *Psilocybe*, the bluing of the fruit bodies finally turns the entire mushroom black. Then as discussed the author (1978c) *P. caeruleus* var. *nigripes* is a merely synonym of the type variety.

P. caeruleus var. *albida* Heim was described from Necaxa, State of Puebla (Mexico) (Heim *et al.* 1967; Heim, 1973) based on sporophores with whitish or yellowish white pileus, but as it is noted in the above description of the type variety, it is common to find the pileus of *P. caeruleus* with these light colors for its hygrophanous nature.

P. caeruleus var. *caeruleus* is very close to *P. farinacea* Rick ex Guzmán and *P. brasiliensis* Guzmán, both from Brazil, to *P. wrightii* Guzmán from Argentina and to *P. papuana* Guzmán & Horak from New Guinea (see discussions of these species). This fungus is very similar to *P. zapotecorum* Heim emend. Guzmán in the form and color of the fruit body. Several collections in MEXU of *P. caeruleus* var. *caeruleus* were found identified as *P. zapotecorum*, as Pastelin, Jul. 23, 1967 (MEXU 4850). Herrera obtained the culture No. 109 from this collection. The color picture of Bigwood (in Stamets, 1978, pl. 13) presented as *P. caeruleus-zapotecorum* complex is undoubtedly *P. zapotecorum*. The same with the picture of *P. caeruleus* in Ott & Bigwood (1978, Fig. 6). On the other hand, Fig. 10 in Schultes & Hofmann (1973) identified as *P. aztecum* is actually *P. caeruleus* var. *caeruleus*.

Heim & Cailleux (in Heim & Wasson, 1958; and in Heim *et al.*, 1967) conducted a study of the cultures of *P. caeruleus*. The fruit bodies they obtained were like the wild fruit bodies. In the mycelia they reported acromoniform forms, anastomoses, thick walled hyphae and clamp connections. Singer (1958b) and Guzmán (1959a) made studies of cultures of *P. caeruleus*, obtained in Huautla de Jiménez region. Dubovoy & Herrera (1967; 1968a,b) presented a study on the mycelia of *P. caeruleus* obtained from a spore print of a specimen from Huautla de Jiménez; they reported formation of oidia, and emphasized was made the absence of clamp connections in submerged cultures; the influence of physicochemical factors in the morphogenesis of clamp connections was hardly studied, and the physicochemical factors in asexual structures were also discussed. Semerdzieva & Musilek (1976) reported a culture of this species at their Institute. Guzmán (1978c) reported sclerotia from *P. caeruleus* var. *caeruleus* collected in Huautla de Jiménez region. These sclerotia are globose, 15-25 mm diam., subhypogeous, fleshy, whitish or brownish and staining irregularly blue-green to blackish; when dry they are very hard; they do not contain spores, but hyaline or brownish elongated (1.5-4 µm diam.) or subglobose hyphal cells (10-25 µm diam.) are present in the context and in the peridium.

It is interesting to note that the first record of *P. caeruleus* as an hallucinogenic fungus was made by Heim (1956a), in the description of *P. mazatecorum* Heim, which was based on a collection made by Wasson in 1953 in Huautla de Jiménez region (but this collection does not seem to be in PC Herbarium, where the author found only the type of *P. caeruleus* var. *mazatecorum* f. *heliophila* Heim,

collected by Heim, in July 1956). Murrill (1923) did not mention any use or property this fungus. But in FH there is an interesting collection of *P. caeruleus* made by Schultes in Huautla de Jiménez on Jul. 27, 1938, and identified by Singer on Sept. 3, 1943 as *Deconica* sp.

SELECTED ILLUSTRATIONS. Heim & Wasson (1958, pl. XIV, figs. 1-6; pl. XV, figs. 1-9; pl. XVI, figs. 1-6; pl. XXI, figs. 1-4 & 6); Heim *et al.* (1967, pl. VII, figs. 1-5); Guzmán (1978d, p. 114).

16. *Psilocybe caeruleus* Murr. var. *ombrophila* (Heim) Guzmán, stat. nov.
Figs. 68-72, 715-716 & 718

P. caeruleus var. *mazatecorum* f. *ombrophila* Heim, *Champ. Halluc. Mex.*, p. 140, 1958, nom. subnud.

P. caeruleus ssp. *mazatecorum* var. *ombrophila* Heim, *Rev. Myc.* 37: 183, 1973.

P. mixaensis Heim, *Rev. Myc.* 24: 104, 1959.

Pileus (5-) 15-40 (-50) mm in diam., convex to subcampanulate, not papillate, thin (no more than 1 mm thick), viscid to subviscid, striate at the margin but even when dry. Stipe (1-) 2-5 (-8) mm thick. The other macroscopic features of the pileus and stipe are as the type variety. Microscopically it is similar to the type variety.

HABITAT AND DISTRIBUTION. Solitary, more rarely gregarious or somewhat fasciculate, on soil or more common on humus, preferably in shade places without herbaceous plants, in coffee plantations or in deciduous forests, rarely in sugar cane plantations or on foot paths. Known only from Mexico (State of Oaxaca), between 1000-1800 m elevation. The collection *Jacobs 42* seems to have been found an elevation of at 300 m, according to the herbarium notes. Fruiting between June-August.

STUDIED MATERIAL. MEXICO, State of Oaxaca, District of Tuxtepec, trail Temascal to Huautla de Jiménez, *Jacobs 42* (ENCB). Huautla de Jiménez region Heim F-777 (PC as *P. semperviva*); Guzmán 1457-B & 1877 (ENCB). Rancho El Cura (near Huautla de Jiménez), Guzmán GH-1107 (ENCB, LIL) (this specimen was identified as *P. caeruleus* var. *nigripes* by Singer) (Singer, 1958); Heim 19 (PC, type of *P. caeruleus* ssp. *mazatecorum* var. *ombrophila*). Rio Santiago, *Jacobs 24* (ENCB). Coatlan to Mazatlan (Mije zone), *Hoogshagen & Cabrero* s.n. (Jul. 14, 1958) (PC, type of *P. mixaensis*). Coatlan, *Hoogshagen & Cabrero* s.n. (Jul. 14, 1958) (PC). Near San Juan Mazatlan (Mije zone), Heim (Jul. 1954) (PC). San Juan Mazatlan (Mije zone), *Lipp 23* (ENCB). Amatepec-Totontepec, *Jacobs 11* (ENCB). Near Ayautla, *Jacobs 48* (ENCB). Near Totontepec, *Jacobs 64* (ENCB). San Juan Juquila (Distr. of Yaitepec), *Lipp 41-A* (ENCB). State of Veracruz, Municipio de Tenochtitlán, Cuauhtémoc (Chahcichinal), Chiconquiaco zone, *Streets-Pearl & Heim* s.n. (PC).

DISCUSSION. As Guzmán (1978c) discussed, the small pileus, the thin stipe, and the preference for shaded habitats separate this variety from the type variety. Heim and

Cailleux (in Heim & Wasson, 1958; Heim *et al.*, 1967) cultured this fungus. The fruit bodies obtained are slightly larger than wild ones as happens with all cultured species (see Table VI in Heim *et al.*, 1967), which compares wild and cultured fruit bodies), but in both forms the microscopic features are nearly the same.

The mycelia in the cultures of *P. caerulescens* var. *ombrophila* has the same features as that of the type variety. It is common to observe clamp connections, arthrospores or oidia, thick walled hyphae, etc., such as those observed by Heim & Cailleux (*op. cit.*) and Dubovoy & Herrera (1967, 1968) in the type variety.

P. mixaeensis Heim is synonymous with *P. caerulescens* var. *ombrophila* (Guzmán, 1978c). *P. mixaeensis* was described from mature open specimens without veil. The synonymy is based on the study of the type and in the culture obtained by Heim & Cailleux (in Heim *et al.*, 1967). On the other hand, *P. semperviva* Heim & Cailleux is a synonym of *P. hoogshagenii* Heim, a species with pleurocystidia, but the collection Heim F-777 (PC) from Huautla de Jiménez identified by Heim as *P. semperviva* is actually *P. caerulescens* var. *ombrophila*.

The material mentioned by Guzmán (1978c) as probably *P. caerulescens* var. *ombrophila* (Guzmán 2184, ENCB) with large spores, is really an *Agrocybe* sp.; on the other hand, the picture 113 of pl. VIII from the same paper, belongs to *P. hoogshagenii* var. *convexa* Guzmán a closely related species. *P. caerulescens* var. *ombrophila* is hallucinogenic and is used by the Mazatecs of Huautla de Jiménez region, or by the Mijes of Mazatlan as a medicine for shamanic divination.

The name of this variety means shade, from the Latin *umbra*, in connections with the habitat in shade places.

SELECTED ILLUSTRATIONS. Heim & Wasson (1958, pl. XIV, figs. 7-8; pl. XXI, fig. 9; pl. XXIII, figs. 3-4). Heim *et al.* (1967, fig. 13; pl. VI).

17. ***Psilocybe columbiana*** Guzmán *Mycotaxon* 7: 237, 1978.

Figs. 73-78, 670, 708, 729 & 732

Pileus 6-19 mm in diam., convex to campanulate, not expanding at maturity, even to slightly rimose, faintly striate transparent when moist, lubricous, hygrophanous, reddish brown to reddish yellow, fading finally to pallid yellow or straw color.

Lamellae adnate to adnexed, violaceous ochre or dark violaceous dark, with whitish edges.

Stipe 20-60 × 1-3 µm, cylindrical, equal, sinuous, hollow, white to reddish brown, covered with floccose appressed white fibrils, with a long rhizomorphic white prolongation (pseudorhiza) in the soil, up to 20 mm long. Turning blue when touched or injured.

Veil white, arachnoid to floccose in young stages; a distinct annulus absent.

Context of the pileus white and pliant, concolorous with surface, tough in stipe, staining blue when cut. Odor and taste farinaceous.

Spore print dark violet brown.

Spores (6.6-) 7.1-8 (-8.8) × (4.9-) 6-6.6 (-7.1) × 4.4-5.5 µm, subrhomboid in frontal view, subellipsoid in lateral view, light brownish chocolate or yellowish brown, thick walled, with a broad and flat germ pore.

Basidia 15-27 × 4.4-8 µm, 4-spored, hyaline, subpyriform.

Pleurocystidia absent.

Cheilocystidia 22-30 × 3.3-6.5 µm, abundant, forming a sterile band, hyaline, thin walled, lageniform or fusoid-ampullaceous and mucronate, sometimes branched; the neck 1.6-2.2 µm across.

Subhymenium formed by subglobose, subhyaline cells with yellowish brown or orange brown irregularly incrusting pigment. Trama regular, hyaline, with elongate hyphal cells 15-25 µm diam., thin walled (1.5 µm thick). Epicutis a subgelatinized thin layer, with parallel hyaline hyphae 2-6 µm broad. Hypodermium with elongated hyaline to brownish hyphae, 12-20 µm diam., thick (2 µm) walled. Clamp connections present.

HABITAT AND DISTRIBUTION. Solitary or gregarious on black clay soils without herbaceous plants, sometimes living together with *Aleuria aurantia* (Pers. ex Fr.) Fuck., in the high mountains or "páramos" of *Espeletia argentea*, at 3300-3500 m elevation. Known only from the type location. Fruiting in July.

STUDIED MATERIAL. COLOMBIA, Department of Cundinamarca, Municipio of Tansa, road La Represa del Río Neusa to la Torre de Transmisión de TV, Guzmán 9146 (Type COL; Isotypes ENCB & NY); other collections from the same locality are Guzmán 9145, 9156; 9158 & 9159 (all in COL and ENCB).

DISCUSSION. A species close to *P. wassoniorum* Guzmán & Pollock because of the pseudorhiza and large cheilocystidia, but differs in the size of the spores. *P. wassoniorum* is known only from subtropical forests of Mexico. The thick wall of the spores separate this species from *P. pintonii* Guzmán, which grows in the same high mountains of Colombia. *P. columbiana* surely is an hallucinogenic fungus because it turns blue and has farinaceous taste and odor, but there is not any information on its uses in Colombia or on its chemistry.

18. ***Psilocybe cordispora*** Heim *Rev. Myc.* 24: 103, 1959.

Figs. 79-81

Pileus (5-) 7-11 (-18) mm in diam., conic to subumbonate, sometimes nearly plane at the maturity, even, somewhat striate at margin when moist, subviscid or lubricous to dry, dark brown to brownish red, then beige olivaceous or yellowish, sometimes blackish when dry.

Lamellae adnate to adnexed, light brown, brownish red to dark violet brown, edges concolorous or somewhat whitish.

Stipe (20-) 25-50 × 1-5 mm, equal or slightly thicker at the base, hollow, slightly covered by white floccose fibrils; staining blue on the lower portions.

Veil not well developed, present as white fibrils at the margin of the pileus, but soon disappearing.

Context whitish to light ochraceous in pileus, brownish in stipe; slightly bluing. Taste and odor weakly farinaceous.

Spore print dark violet brown.

Spores (4.4-) 5.5-6.6 (-7.7) × 3.8-4.4 × 3.5-4 μm, subrhomboid in face view, subellipsoid in side view, thick walled, brownish yellow, with a broad apical germ pore, and a short hilar appendage at the base; some spores irregular or asymmetric in form.

Basidia 12-17 × 5-6 μm, 4-spored, rarely 6-spored, hyaline, clavate or cylindric.

Pleurocystidia absent.

Cheilocystidia (20-) 25-35 × 5-6 μm, hyaline, elongated fusiform, not branched, with long flexuous necks and apex ampullaceous, 1.5-2.5 μm diam.

Subhymenium subcellular, hyaline but irregularly incrustated with brownish yellow pigment. Trama regular, brownish yellow, with thin to thick walled parallel hyphae, up to 17 μm diam. Epicutis formed by a subgelatinized hyaline to brownish, layer, with irregularly incrustated elongated hyphae. Hypodermium with hyaline to brownish orange irregularly incrustated hyphae up to 20 μm diam. Clamp connections present.

HABITAT AND DISTRIBUTION. Solitary or in small groups on clay soil, with or without herbaceous plants, in subtropical forests, at 1000-1800 m of altitude. Known only from Mexico (Huatla de Jiménez region and Mije zone, both in the State of Oaxaca). Fruiting in June to August.

STUDIED MATERIAL. MEXICO, State of Oaxaca, Coatlán (Mije zone), *Hoogshagen* s.n. (Jul. 21, 1954) (PC Type; ENCB Isotype); *Heim* s.n. (Jun. 1954) (PC; ENCB). San Juan Mazatlan (Mije zone), *Lipp* 22 (ENCB). Huatla de Jiménez, *Pollock* 7-30-78-1 & 7-30-78-4 (ENCB). Near Puente de Fierro (Huatla de Jiménez region), *Jacobs* 54-B (ENCB).

DISCUSSION. The narrow spores as well as the large, unbranched cheilocystidia, readily separate this species from the others of the section. The record of *P. cordispora* from British Honduras (Pegler & Young, 1971), based on a collection of *Hedger* No. 101 made in 1966 and deposited in K, probably is different species of this group, possibly *P. mammillata* or some tropical species (*P. uxpanapensis*?), on the basis of the size of the spores as reported by Pegler & Young: 5-7.5 × 4-6 μm.

This species was first described in French (Heim, 1956a; Heim & Wasson, 1958), and finally (1959) described in Latin, but all accounts were based only on the type

specimens. The other localities are additional records. The specimens (MEXU 3951) reported (Guzmán, 1978c) from La Caldera, on the road from Oaxaca to Pochutla, belongs to *P. mammillata* because of the short cheilocystidia. The specimen *Guzmán* 900 bis first identified as *P. cordispora* and deposited in MICH, is *P. heimii*.

P. cordispora is hallucinogenic fungus and is used by the Mije and Mazatec Indians, but there have not been any chemical studied on it. Heim & Wasson (1958) and Heim *et al.* (1967) did not report any culture information.

The name of the species refers to the heart-like shape of the rhomboid spores in face view.

SELECTED ILLUSTRATIONS. Heim & Wasson (1958, pl. XV, figs. 17-19).

19. *Psilocybe dumontii* Sing. ex Guzmán *Mycotaxon* 7: 240, 1978 Figs. 82-84

Pileus 8-15 mm in diam., conical to subumbonate, even to slightly striate toward the margin when moist, hygrophanous, brown when fresh to yellowish brown when faden, subviscid or lubricous to dry.

Lamellae adnate, very thin, dark violaceous brown, edges concolorous or slightly whitish.

Stipe 25-35 × 1-1.5 mm, cylindric, equal or somewhat bulbous, hollow, whitish to reddish brown, densely covered by floccose white fibrils of velar origin.

Veil soon obliterated, inconspicuous in the adult carpophores.

Context whitish, staining blue to dark-blue when injured. Odor and taste not tested.

Spores (4.4-) 4.9-5.5 (-6) × 4.4-4.9 × 3.3-4 μm, subrhomboid or rhomboid in frontal view, subellipsoid in side view, brownish yellow or light brownish chocolate, thick walled and with a broad germ pore.

Basidia 11-17 × 4.4-6 μm, 2- or 4-spored, hyaline, cylindrical-ventricose.

Pleurocystidia absent.

Cheilocystidia 10-18 (-26) × 3.3-6 (-7.7) μm, abundant forming a sterile band, polymorphous, fusoid, ventricose-rostrate, clavate, strangulate or mucronate, hyaline to somewhat brownish.

Subhymenium with elongated to globose elements, 5-15 μm diam., strongly and irregularly incrustated with chocolate brown, in some parts a blue pigment can be seen diffused in the KOH between the hyphae. Trama regular, with hyaline or pigmented hyphae, 5-25 μm diam., thick walled (1-3.3 μm thick), some are solid. Epicutis as a thin subgelatinized layer, formed by brown reddish to hyaline hyphae, parallel to the surface. Hypodermium formed by subglobose elements irregularly incrustated. Clamp connections present.

HABITAT AND DISTRIBUTION. Gregarious on rotten wood in a subtropical forest, at 1800 m elevation. Known only from the type locality.

STUDIED MATERIAL. PANAMA, Prov. Chiriqui, Cerro Punta, near Nueva Suiza, Dumont PA-2074 (Type NY; Isotype at ENCB).

DISCUSSION. This species is close to *P. furtadoana* Guzmán but differs in the polymorphous cheilocystidia. It is also close to *P. yungensis* Sing. & Smith, but the presence of pleurocystidia in that species separate these mushrooms well. The somewhat brownish cheilocystidia connects *P. dumontii* with those of the Section *Brunneocystidiatae*, common in the tropical rain forests, and illustrates the relationships between both sections *Cordisporae* and *Brunneocystidiatae*.

The name of this species is in honor of Dr. K. Dumont who collected the type and sent it both Dr. Singer and Dr. Guzmán.

20. *Psilocybe fagicola* Heim & Cailleux *Rev. Myc.* 24: 438, 1959 var. *fagicola*
Figs. 85-88 & 712

Pileus (5-) 10-15 (-25) mm in diam., conic or convex to campanulate, subumbonate or umbonate, frequently with a papilla (1-2 mm high), even and more or less glabrous, lubricous, striate at the margin when moist, sometimes somewhat wrinkled, strongly hygrophanous, dark reddish brown, brown chocolate or grayish brown, fading to brownish yellow, olivaceous, yellow or grayish-green; turning blue when handled, sometimes becoming and remaining blackish blue.

Lamellae adnexed, or somewhat sinuate, grayish to reddish brown, gray violaceous or dark, violaceous, somewhat spotted, with whitish edges.

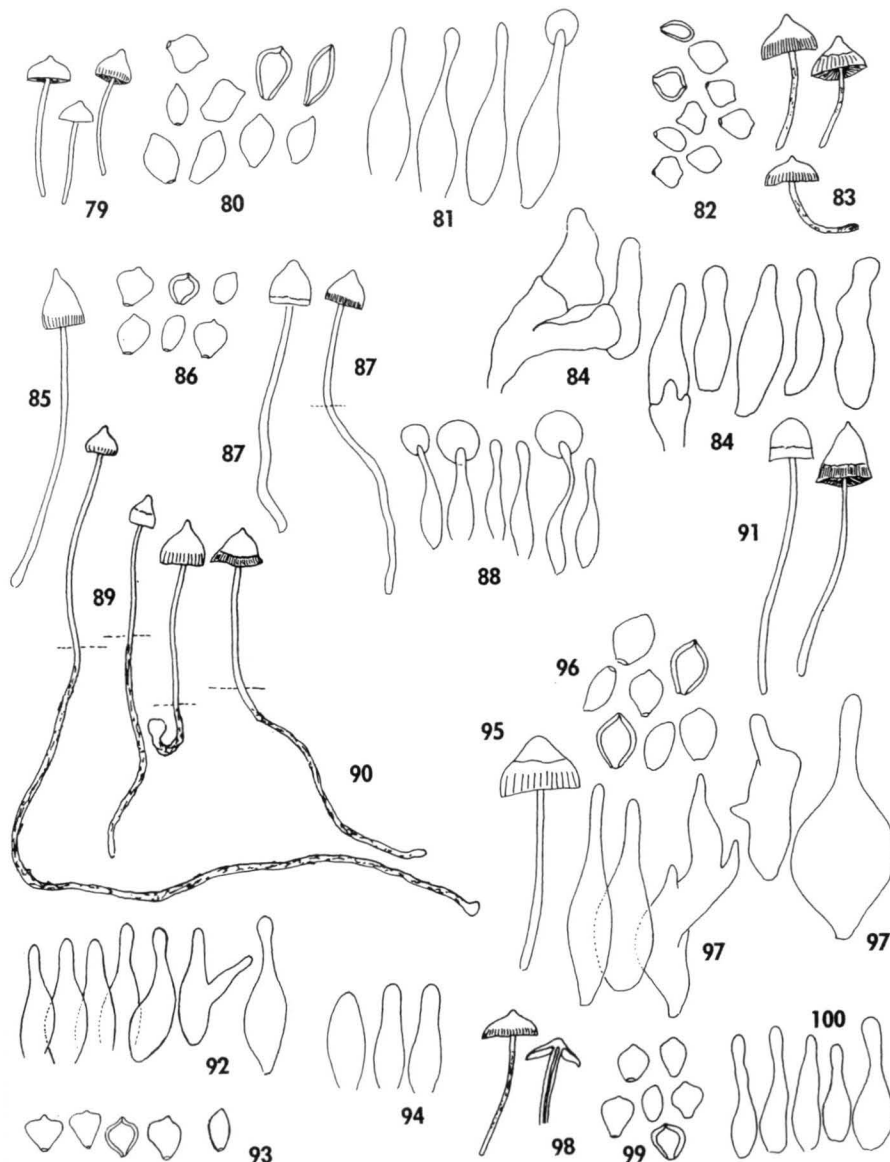
Stipe 40-60 × 0.7-2 mm, cylindric, equal or somewhat subbulbous, hollow, flexuous, cartilaginous, reddish brown but more paler at the apex; whitish mycelium present toward the base; covered with white floccose fibrils; with a long flexuous whitish pseudorhiza, sometimes more than 100 mm long.

Veil poor developed, leaving white to grayish fugacious fibrils on the margin of the pileus, as small appendices.

Context thin and translucent, whitish to brownish in the pileus, yellowish or brownish red in the stipe, fibrillose to cartilaginous, or pliant. Turning blue. Odor and taste farinaceous.

Spore print dark violaceous brown.

Plate 15: Figs. 79-100. - Several species of *Psilocybe*. 79-81: *P. cordispora*, 79: Carpophores, 80: Spores, 81: Cheilocystidia (all from the type). 82-84: *P. dumontii*, 82: Spores, 83: Carpophores, 84: Cheilocystidia (all from the type). - 85-88: *P. fagicola* var. *fagicola*, 85: Carpophores, 86: Spores, 87: Carpophores, 88: Cheilocystidia (85-86: type; 87-88: Guzmán 2391). 89-93: *P. fagicola* var. *mesocystidiata*, 89-91: Carpophores, 92: Cheilocystidia, 93: Spores, 94: Pleurocystidia (89 & 92-94: type; 90: Evans; 91: Guzmán 16923). 95-97: *P. fuliginosa*, 95: Carpophore, 96: Spores, 97: Cheilocystidia (all from the type). 98-100: *P. furtadoana*, 98: Carpophore, 99: Spores, 100: Cheilocystidia (all from the type).



Spores (4.9-) 5.5-6 (-6.5) $\times$ 4.9-5.5 $\times$ 3.3-3.8 μ m, subrhomboid in face view, sub-ellipsoid in profile view, smooth, thick walled (0.8-1.2 μ m) dark yellowish brown, with a broad germ pore.

Basidia 11-20 $\times$ 4.5-6.5 μ m, 4-spored or 2-spored, hyaline, ventricose cylindric or cylindric pyriform.

Pleurocystidia scanty, difficult to find. When present they are 13-17 $\times$ 5-6 μ m, subfusiform or sublageniform and hyaline.

Cheilocystidia 6-13 $\times$ 2.5-3.3 μ m, abundant, hyaline, obclavate with long neck, 1-2 μ m thick, sometimes with a hyaline viscous drop, 5-10 μ m diam. at the apex.

Subhymenium subcellular, hyaline with orange brown pigment irregularly incrusting the walls. Trama regular, hyaline to yellowish, with thick (1-2) (-4) μ m walled hyphae, 6-22 (-40) μ m diam., irregularly incrusting on the walls with brownish yellow pigment. Epicutis subgelatinized, with parallel elongated hyaline or subhyaline hyphae. Hypodermium brown to hyaline, with elongated hyphae to globose cells thick walled and irregularly incrusting with yellowish brown pigment. Clamp connections present.

HABITAT AND DISTRIBUTION. Solitary or in small groups on humus rich in leaves, or sometimes between mosses, in a pure *Fagus mexicana* ("hayas") forest, at 1850 m. Known only from the type locality, where it seems very common. Only one collection (Guzmán 2666) was found in *Liquidambar-Pinus-Quercus* forest at 2000 m of elevation close to the type locality. Fruiting in July to August.

STUDIED MATERIAL. MEXICO, State of Hidalgo, southeastern Zacualtipan, near Zacualtamaya ("Bosque de hayas"), Heim F-636 (PC Type; Isotype ENCB); Guzmán 2391; 2666; 2667; 2678; 2683; 2679 (all in ENCB except 2391 that is also in MICH).

DISCUSSION. The long pseudorhiza separate this species from others of the Section *Cordisporae*, except from *P. columbiana*, *P. wassoniorum* and *P. xalapensis*, but differs in the small cheilocystidia. Heim and Cailleux first (1959a) described this species in French, then (1959b) in Latin. In both descriptions he did not designate any type, nor is any herbarium material cited. But later (in Heim *et al.*, 1967), Heim presented new information and an excellent color plate of this fungus, where only specimen 636 is mentioned. The author found at PC the specimen F-636 as the only representation of *P. fagicola*. Thus, this is considered the type, of which Heim kindly gave a duplicate (Isotype) to the ENCB Herbarium. Cultures of *P. fagicola* were made by Heim & Cailleux (Heim & Cailleux, 1959; Heim *et al.*, 1967). The mycelium is similar to that of *P. yungensis* Sing. & Smith, with presence of varicose and elongated-filiform hyphae, spiral hyphae and acromoniform hyphae. Fruit bodies were not obtained in culture. *P. fagicola* var. *fagicola* is an hallucinogenic fungus, but there is not information on its chemistry.

The name of this species refers to the *Fagus* forests where it grows.

SELECTED ILLUSTRATIONS. Heim *et al.* (1967, pl. VIII, figs. 1-13).

21. *Psilocybe fagicola* Heim var. *mesocystidiata* Guzmán Nov. *Hedwigia* 29: 629, 1978. Figs. 89-93

Cheilocystidia 8.8-15 $\times$ 3.3-4.3 μ m, lageniform, with necks 1-2 μ m diam. Pleurocystidia scarce, fusoid-ventricose, hyaline. The other features are as the type variety.

HABITAT AND DISTRIBUTION. Gregarious in small groups, on leaves and soil with debris (humus), in subtropical forests with *Liquidambar* and *Quercus*, or in *Pinus-Quercus* subtropical forests; between 1700-2000 m elevation. Known only from Mexico from the States of Oaxaca and Veracruz. Fruiting in June to October, but more frequently in July.

STUDIED MATERIAL. MEXICO, State of Oaxaca, Oaxaca City to Tuxtepec road, between La Esperanza and Llano de Las Flores, Varela 210 (ENCB). State of Veracruz, Chiconquiaco to Santa Rita road, near Paz de Enriquez, Guzmán 16923; 16924; 17013 & 17014 (all in ENCB). Municipio de Jilotepec, El Esquilón, Guzmán 16933 & 16934 (all in ENCB). Acatlán, Sierra de Chiconquiaco, Ventura 11542 (Type ENCB; Isotype NY). Loma Alta (Sierra de Chiconquiaco), Evans (K, MEXU 2997 as *P. cordispora*; ENCB). Road Xalapa-Perote, Acajete, Ventura 2181 (ENCB). San Juan El Soldado, Ventura 10297 & 10299 (ENCB). Northeastern of La Joya, Guzmán 16381 (ENCB).

DISCUSSION. As previously noted (Guzmán, 1978c), the thick cheilocystidia separate this variety from the type variety. The bluing reaction as well as the farinaceous taste and odor suggest that this fungus is hallucinogenic.

The varietal epithet refers to the intermediate size of the pleurocystidia, thicker than those of the type variety and thinner than those of other close species as *P. mammillata*.

22. *Psilocybe fuliginosa* (Murr.) Smith *Mycologia* 40: 697, 1948. Figs. 95-97

Athylospora fuliginosa Murr., *Mycologia* 10: 25, 1918.
Psathyra fuliginosa Murr., *Mycologia* 10: 33, 1918.

Pileus 10-20 mm in diam., hemispheric or convex to subcampanulate, not expanding, non-umbonate and non-papillate. Surface even, glabrous, slightly striate at the margin, hygrophanous, sooty or fuliginous, or sometimes reddish brown, becoming somewhat paler (yellowish) on the disc to dark beige when fading.

Lamellae adnate, fuliginous to brown chocolate, with whitish or concolorous edges.

Stipe 40-50 $\times$ 1.5-2 mm, equal or somewhat larger below, smooth, glabrous, concolorous with the pileus to whitish toward the base; becoming blackish in drying.

Veil white, poor developed, soon evanescent.

Context not studied.

Spores (5.5-) 6-7.1 (-7.7) $\times$ 4.4-5.5 $\times$ 3.8-4.4 μm (very rarely 8.2 $\times$ 6.6 μm), subrhomboid in face view, subellipsoid in side view, thick walled, dark yellowish brown, with an apical hyaline germ pore.

Basidia 4-spored, 18-20 $\times$ 5-6 μm , hyaline, ventricose.

Pleurocystidia absent (or similar to cheilocystidia near the edge of the gill).

Cheilocystidia 16-28 (-33) $\times$ 4.4-6.6 (-8.8) μm , hyaline, abundant, forming an sterile band, narrowly ventricose or subglobose ventricose, frequently branched, with flexuous long neck, apex acute to subacute, many with a highly viscous substance adhering near to or at the apex.

Subhymenium hyaline to brownish or brownish, with more or less incrustated hyphae. Trama of parallel hyphae sordid yellowish brown, with thick walled (more than 1 μm thick), irregularly incrustated. Epicutis formed by a hyaline inconspicuous thin layer of subgelatinous parallel hyphae. Hypodermium with hyaline to brownish subglobose or elongated hyphal cells, irregularly incrustated.

HABITAT AND DISTRIBUTION. Gregarious or caespitose in damp soil in subtropical forests, at 1500 m elevation. Known only from the type locality. Fruiting in December and January.

STUDIED MATERIAL. JAMAICA, near Cinchona, Morce's Gap, *Murrill 748* (Type NY). Other collection from the same locality: *Murrill 680* (NY no seen).

DISCUSSION. The branched cheilocystidia, non-umbonate and non-papillate pileus separate this species from all others of the Section. According to Murrill's notes it is close to *P. plutonia* (B. & C.) Sacc. but that species has pleurocystidia and a conic or subumbonate pileus. Smith (1940) studied the type of this species and commented on another collection made by Burke in Alabama (U.S.A.), which appears to belong to Murrill's species, but he did not give any description, except for the length of the spores which he said are 6.5-8 μm . This collection possibly is *P. caerulescens* Murr.

We lack information on the chemical constituents of *P. fuliginosa*, and not mention of a bluing reaction was made by the collector, even no data on odor and taste are available, but the strong relationship to the Sect. *Cordisporae*, however, leads one to suspect *P. fuliginosa* is an hallucinogenic species.

The name of the species means sooty, referring to the dark greyish color of the pileus.

23. *Psilocybe furtadoana* Guzmán *Mycotaxon* 7: 242, 1978. Figs. 98-100

Pileus about 15 mm in diam., subcampanulate to papillate, glabrous, even, translucent striate when moist, lubricous, hygrophanous, dark reddish brown to ochraceous or stramineous color.

Lamellae adnexed, dark violet brown with whitish edges.

Stipe about 35 $\times$ 1 mm, cylindrical, equal, hollow, reddish brown towards the base, covered with whitish floccose fibrils of the veil.

Veil poor developed, as a white fibrillous-subfloccose fibrils in young specimens.

Context whitish, fleshy in the pileus, brownish and fibrillose in the stipe; slightly blue-staining when cut. Taste and odor farinaceous.

Spores (4.5-) 5.5-6.6 (-7) $\times$ (3.8-) 4.4-4.9 (-5.5) $\times$ 3.8-4.2 μm , subrhomboid frontally, subellipsoid in profile, yellowish brown, thick walled, with a broad germ pore.

Basidia 10-13.2 $\times$ 4.4-5.5 μm , 4-spored, hyaline, subventricose.

Pleurocystidia absent.

Cheilocystidia 11-18 $\times$ 4.4-6.6 μm , abundant, hyaline or chocolate brown toward the base, bottle shaped or sublageniform, some fusoid-ventricose.

Subhymenium with elongated parallel hyphae, with reddish brown irregularly distributed pigment. Trama regular, colored like the subhymenium or hyaline, with hyphae up to 6 μm diam. Epicutis as a subgelatinous thin layer of reddish brown to hyaline hyphae, around 4 μm diam. Hypodermium hyaline to brownish, with hyphae thin walled, 5-12 μm diam. Clamp connections present.

HABITAT AND DISTRIBUTION. Solitary on soil or humus in open forests of *Araucaria brasiliana* with *Podocarpus*. Known only from the type locality. Fruiting in March.

STUDIED MATERIAL. BRAZIL, 5 km West of Campos de Jardo, State of Sao Paulo, *Guzmán 8918* (Type SP; Isotype ENCB).

DISCUSSION. The brownish cheilocystidia connects this species with *P. dumontii* Sing. ex Guzmán and with those of the Section *Brunneocystidiatae*. It is also related to *P. brasiliensis* Guzmán but the absence of pleurocystidia and the size of the spores and cheilocystidia delineate this species clearly. This species probably is a hallucinogenic fungus because it turns blue and has farinaceous taste and odor.

The name of this species is in honor of Dr. J.S. Furtado, who help to the author in his explorations in southern Brazil, and in particular in the type collection.

24. *Psilocybe goniospora* (B. & Br.) Sing. *Sydowia* 15: 70, 1961. Figs. 101-104

Agaricus (Flammula) goniosporus B. & C., *J. Linn. Soc. Bot.* 11: 541, 1871.

Flammula goniospora (B. & C.) Sacc., *Syll. Fung.* 5: 827, 1887.

Deconica goniospora (B. & C.) Sing., *Sydowia* 9: 404, 1955.

Psilocybe goniosperma (B. & C.) Sing., *Agaricales*, p. 543, 1975.

Pileus (5-) 10-15 (-20) mm in diam., convex to subumbonate, with a small papilla, probably hygrophanous, reddish brown to dingy white, fading yellowish beige with a dark zone on the disc, margin no striate.

Lamellae broadly adnate to subdecurrent, brownish to dark violet brown, somewhat pallid at the edges.

Stipe 15-25 × 1-2 mm, equal or slightly thickened toward the base, hollow, flexuous, springing from a white more or less globose base, yellowish to brownish.

Veil white, arachnoid, poorly developed, soon evanescent.

Context thin, fleshy, whitish. Taste and odor not checked.

Spores 5.5-6.6 (-7) × 4.9-5.5 (-6) × 3.8-4.4 μm, rhomboid or subrhomboid in frontal view, subellipsoid in profile view, yellowish brown, thick walled, with a broad apical germ pore.

Basidia not studied.

Pleurocystidia 19.8-23 × 8.8-13 μm, hyaline, abundant, ventricose, ventricose-submucronate or subnapiform-ventricose, thin walled.

Cheilocystidia 16.5-23 × 5.5-7.7 μm, abundant, hyaline, sublageniform, with a long neck 2.2-3.3 μm diam., sometimes the necks are irregularly constricted.

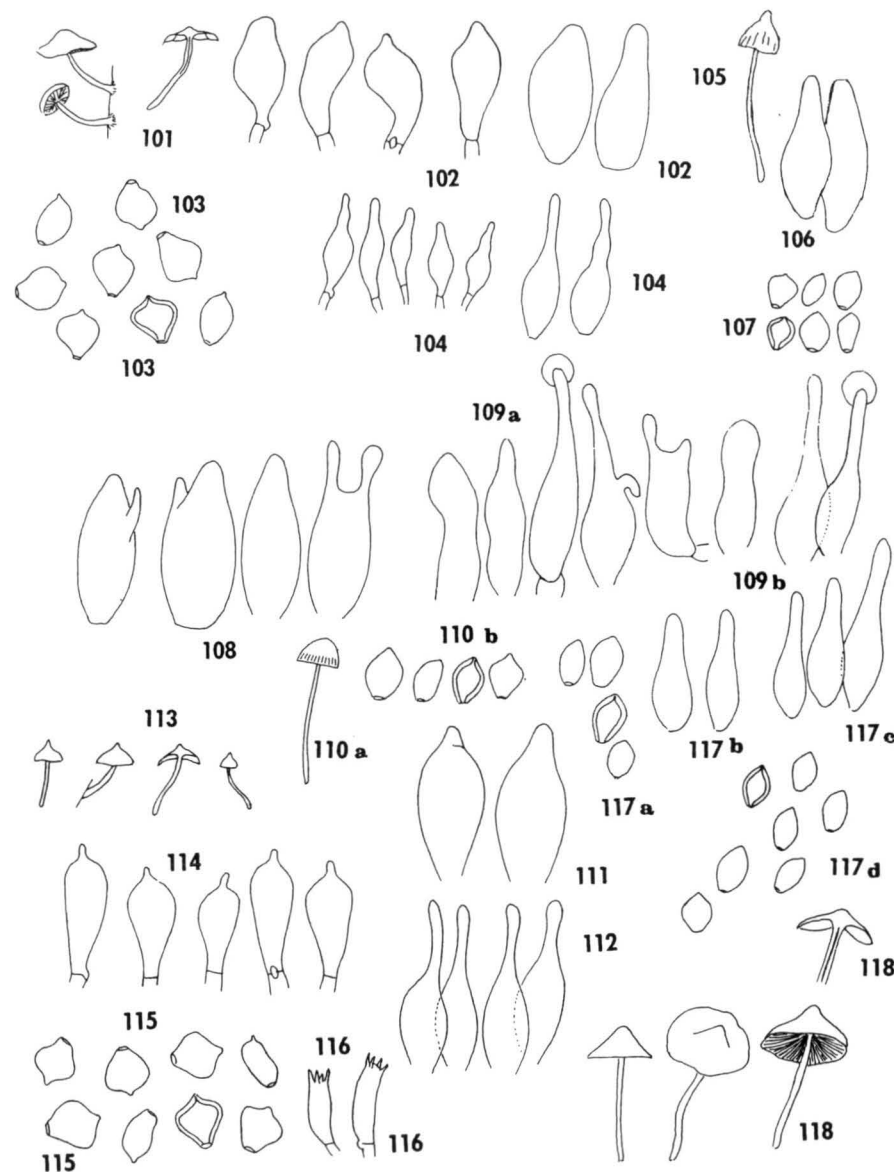
Subhymenium with hyaline to brownish hyphae and also lactiferous hyphae, 3.3-4.4 μm diam. Trama regular, hyaline to pale brownish orange, with parallel more or less thick hyphae. Epicutis layer composed of filamentous repent subgelatinized and hyaline hyphae. Clamp connections present.

HABITAT AND DISTRIBUTION. Gregarious on dead wood, in tropical vegetation. Known from the type locality and possibly from Uganda (Africa). Fruiting in November.

STUDIED MATERIAL. CEYLON, SRI LANKA, Peradeniya, *Thwaites 835* (K Type).

DISCUSSION. This species is close to the Mexican fungus *P. schultesii* Guzmán & Pollock but differs in the diameter of spores and pleurocystidia, as well as in the habitat. *Agaricus ochreatus* B. & Br. (= *Psilocybe ochreate* (B. & Br.) Horak ex Guzmán) considered by Pegler (1977) as a synonym of *P. goniospora* is an independent species (see that species). Both Singer's (1955) and Pegler's (1977) studies on *P. goniospora* failed to mention pleurocystidia, but the spores and cheilocystidia are as those reported here. Pegler (l.c.) considered *Inocybe rhombispora* Mass. from India a synonym of *P. goniospora*. The same author related *P. goniospora* with *P. yungensis* Sing. & Smith and *P. cordiospora* Heim for the form of the spores.

Plate 16: Figs. 101-118. - Several species of *Psilocybe*. 101-104: *P. goniospora*, 101: Carpophores, 102: Pleurocystidia, 103: Spores, 104: Cheilocystidia (all from the type). 105-108: *P. herrerae*, 105: Carpophore, 106: Pleurocystidia, 107: Spores, 108: Pleurocystidia, 109: Cheilocystidia (105-107 & 109: type; 108: Jacobs 70). 110A: *P. bulbosa* (type). 110B-112: *P. jacobsonii*, 110B: Spores; 111: Pleurocystidia, 112: Cheilocystidia (all from the type). 113-116: *P. lonchophorus*, 113: Carpophores, 114: Pleurocystidia, 115: Spores, 116: Basidia (all from the type). 117A-C: *P. bulbosa*, A: Spores, B: Pleurocystidia, C: Cheilocystidia (all from the type). 117D-118: *P. ochreate*, 117D: Spores, 118: Carpophores (all from the type).



The name of this species describes subangular or rhomboid spores in the frontal view. Berkeley & Broome (1871) described spores nearly square or spade-shaped, "and different from any thing we have seen in this subgenus" (*Flammula*), wrote them.

25. *Psilocybe herrerae* Guzmán *Nova Hedwigia* 29: 644. 1978.

Figs. 105-108, 652 & 726

Pileus 8-10 (-19) mm in diam., conic to convex or papillate, subviscid or slightly lubricous to dry, even to somewhat fibrillose-rimose when observed with a lens. Hygrophanous, brown to sepia, fading to brownish yellow; scanty turning blue.

Lamellae adnate, brownish purpuraceous to brownish violet with whitish edges.

Stipe 40-80 (-110) × 1-2.5 mm equal or slightly attenuate at the apex, hollow, brownish to concolorous with the pileus, fibrillose-floccose, easily turning blue or staining blackish toward the base, with a long pseudorhiza.

Veil poor developed, white, cortinate, remains as floccose fibrils in the apex of the stipe. No annulus formed.

Context thin, whitish to concolorous with the pileus, pliant, turning blue when cut. Odor and taste slightly farinaceous.

Spores 4.9-5.5 (-6) × 4.4-4.9 × 3.3-3.8 µm, rhomboid in face view, subellipsoid in side view, brownish yellow thick walled, with a distinct broad germ pore and a short basal appendage.

Basidia 19-23 × 5.5-6.6 µm, 4-spored, hyaline, clavate.

Pleurocystidia 12-25 × 6-8.8 µm, hyaline, mostly fusoid-ventricose, some are ventricose rostrate with a short neck.

Cheilocystidia 13.2-23 (-27) × 5.5-7.7 µm, hyaline, abundant, sometimes mixed with more or less modified basidia, variable in form, ampullaceous with a long (rarely short) neck 7-11 × 1.5-2.5 µm, sometimes irregularly branched and with viscous hyaline drop at the apex; more rarely ventricose fusoid like the pleurocystidia.

Subhymenium brownish yellow, with parallel thin (± 5 µm diameter) hyphae, with pigment irregularly incrustated. Trama regular, subhyaline to yellowish, with hyphae 6.6-12 µm diameter, with pigment incrustated on the thick (± 2 µm) walls. Epicutis formed by a thin, subgelatinized, hyaline to brownish yellow layer of hyphae 2.5-3.5 µm in diameter, thin to thick walled, with pigment irregularly incrustated. Hypodermium with brown pigmented, elongated hyphae, 4.4-6.6 µm diameter, irregularly incrustated. Clamp connections present.

HABITAT AND DISTRIBUTION. Solitary or gregarious, on sandy-clay soil, among mosses, or on embankments, in road cuts, in open *Pinus-Quercus-Liquidambar*

forests or in subtropical forests, at 1800-1900 m elevation. Known only from Mexico. Fruiting in June-July.

STUDIED MATERIAL. MEXICO, State of Chiapas, road Teapa to Bochil, between Rayon and Pueblo Nuevo, *Guzmán 10443* (Type ENCB; Isotype NY). State of Veracruz, Xalapa to Perote, near Acatepec, *Jacobs 70* (ENCB); Municipio de Jilotepec, El Esquilón, *Guzmán 16935* (ENCB). Southern of Minatitlán, San Pedro, *Pérez-Ortiz 929* (ENCB).

DISCUSSION. A species very close to *P. subyungensis* Guzmán but differs in the size and form of the pleurocystidia (8.8-11 × 3.8-5.5 µm, mostly sublageniform in *P. subyungensis*). It resembles to *P. wassoniorum* Guzmán & Pollock in its pseudorhiza but can be delimited by the absence of pleurocystidia in that species and in the size of the spores. Guzmán (1978c) described *P. herrerae* only from the State of Chiapas (Mexico). The collections from the State of Veracruz are new reports. Because it turns blue and has a farinaceous taste and odor, as well as for its strong relationships to others of the Section *Cordisporae*, *P. herrerae* is very probably an hallucinogenic mushroom.

The name of this species is in honor of Dr. T. Herrera, a Mexican mycologist who helped the author in field work.

26. *Psilocybe hoogshagenii* Heim *Rev. Myc.* 24: 104, 1959, var. *hoogshagenii*

Figs. 119-130, 665, 708 & 719

P. caerulipes var. *gastonii* Sing., *Sydowia* 12: 236, 1958.

P. zapotecorum Heim sensu Singer, *Sydowia* 12: 234, 1958, non *P. zapotecorum* Heim, *Rev. Myc.* 22: 77, 1957.

Pileus (7) 10-25 (-30) mm in diam., conic to subumbonate or campanulate with an acute papilla, sometimes very large (up to 4 mm long), glabrous, subviscid or lubricous, even or sulcate over half the radius of the pileus, hygrophanous, reddish brown to orangish brown or yellow brown, fading to straw color of fulvous; staining blue when touched or injured: sometimes becoming blackish from the papilla to the margin.

Lamellae adnate or adnexed, pale brown, then deep coffee color to blackish violet, with whitish edges.

Stipe (30-) 50-90 (-110) × 1-2 (-3) mm, equal or slightly thickened at the base or subbulbous below, hollow, whitish to brownish red toward the base, easily turning blue when touched or injured at maturity, eventually blackish. Sometimes flexuous and twisted.

Veil poor developed as a white rudimentary cortina, soon evanescent.

Context pliant, whitish in the pileus, yellowish in the stipe; turning blue when cut. Odor and taste farinaceous. KOH stains both pileus and stipe blackish.

Spore print dark violet brown.

Spores (4.9-) 6.5-7.7 (-9.6) $\times$ (3.8-) 4.5-6 $\times$ 4.4-5 μm , rhomboid or subrhomboid in face view, subellipsoid in side view, abnormal spores frequently present in heart shaped or very irregular in form, sometimes spores with two germ pores; yellowish brown, thick walled with a broad germ pore.

Basidia 14-22 $\times$ 5.5-9 μm , 4-spored, rarely 2-spored, hyaline, clavate, subcylindric or with a slight median constriction.

Pleurocystidia 16-36 $\times$ 8-12 μm , abundant, hyaline or subhyaline, but at times brownish in lower portion, ventricose or irregular in form, some are clavate or with a constriction in the middle.

Cheilocystidia (15-) 19-35 $\times$ 4.4-6.6 μm , hyaline, abundant, very crowded, lageniform or ampullaceous, with long neck, 1-3 μm diam., apex acute or rounded capitate.

Subhymenium subcellular, hyaline or yellowish, irregularly incrustated with brownish pigment. Trama regular, hyaline to yellow-brown, thin to thick (1.5 μm) walled, sometimes irregularly incrustated with yellow-brown pigment. Epicutis consisting of subhyaline to reddish brown, subgelatinized layer of hyphae, no more than 5 μm broad. Hypodermium formed by globose to elongated hyaline hyphae, more than 10 μm diam., incrustated by reddish-brown pigment. Clamp connections present.

HABITAT AND DISTRIBUTION. Solitary or in small groups on soil, frequently in damp or muddy clay soils, in subtropical forests of coffee plantations; also growing on humus. The natives of San Agustín Loxicha region say the carpophores grow in flushes (as do the cultivated edible mushrooms), many individuals appearing at once and then disappearing. Known from Mexico (States of Puebla, Oaxaca and Chiapas) in subtropical forest at 1000-1800 m of altitude to Argentina, where they also occur in subtropical forests (Guzmán, 1978a). In Mexico growing between June and July and in Argentina in February.

STUDIED MATERIAL. MEXICO, State of Chiapas, Northeastern of Tapachula, Finca Guatimoc (near Volcan Tacana), Guzmán 547 (ENCB). State of Oaxaca, Huautla de Jiménez region, Guzmán 1876 (ENCB, PC); Guzmán 1878; 1885; 3296 (ENCB); Sabina s.n. (Jul. 31, 1967) (MEXU 6276 & 6279); Wasson W-563 (PC; LIL; ENCB); Pollock 7-26-78-1 & 7-27-78-1 (ENCB); P. Smith s.n. (Jul. 1973) (ENCB); Ott s.n. (Jul. 1, 1975) (ENCB). Ranchería Agua Fierro (near Huautla de Jiménez); Guzmán GH-1128-A (ENCB Type of *P. caerulipes* var. *gastonii*; Iso-types at BAFC, LIL and MICH); Guzmán GH-1128-C (MICH as *P. isauri*). Jalapa de Díaz to Ayautla, Jacobs 41; 58 & 59 (ENCB). Sierra de Juárez, Cerro Metate, Martínez-Calderón s.n. (Jul. 1965) (MEXU 2996). Near Totontepec, Jacobs 10 & 65 (ENCB). Coatlán (Mije zone), Cabrero & Hoogshagen "A" (Jul. 14, 1958) (PC Type; ENCB Isotype); Cabrero & Hoogshagen "B" part (Jul. 14, 1958) (PC). San Juan Mazatlan (Mije zone), Lipp 17, 18 & 29 (ENCB). South of San Agustín Loxicha, near Chilapa, Guzmán SA-1501 (ENCB) (LIL and MICH as *P. zapotecorum* by Singer). State of Puebla, southeastern of Necaxa, Guzmán 1577 (ENCB) (LIL as *P. aff. zapotecorum* by Singer); Guzmán 2114 & 2119 (ENCB); Ortega 76 (ENCB).

ARGENTINA, Prov. Buenos Aires, Delta Rio Parana, Bettucci s.n. (Apr. 28, 1962) (BAFC as *P. zapotecorum*).

DISCUSSION. This species was not treated by Singer & Smith (1958b), but the description by Singer (1958a) of *P. zapotecorum* Heim agrees well with *P. hoogshagenii*. Singer's description was based on a specimen sent by the Guzmán in 1958 (SA-1501); the spores, pleurocystidia and cheilocystidia, as well as the color and shape of the fruit body all concur closely with the type of *P. hoogshagenii* (compare the figures). The variation in the form of the pileus from strongly papillate (which is most common) to convex or subumbonate, convinced the author to designate a new variety of *P. hoogshagenii* (see following description).

P. caerulipes var. *gastonii* Sing. described by Singer (1958a) is another synonym of the type variety of *P. hoogshagenii*. However the type of *P. caerulipes* var. *gastonii* caused some confusion (Guzmán, 1978c). Singer selected it from a collection made by Guzmán in 1958 in Huautla de Jiménez region and sent it to LIL. Guzmán's material unfortunately was a mixed collection of at least two species. One part was collected on a rotten trunk within a deciduous forest, and the other part was obtained through the Indians who so kindly helped the author. The mushrooms they called "pajaritos de monte" ("little birds of the woods") and they were registered with the number GH-1128. Singer described *P. isauri* Sing. (Type GH-1128) and *P. caerulipes* var. *gastonii* (Type GH-1128-A) from this material, based on the fact that the first had a dry pileus and the second had a viscid pileus. However, examinations of the type of *P. caerulipes* var. *gastonii* in LIL and isotypes in BAFC and ENCB, showed this fungus belongs to those obtained by Guzmán through the Indians, because they grow on soil (as it is possible to see on the base of the stipe); they have a subgelatinous epicutis and subrhomboid thick walled (1-1.5 μm) spores (6.5-) 7-8 (-9.5) $\times$ (4.4-) 5.5-6.6 $\times$ 4.4-5.5 μm ; they have hyaline pleurocystidia, 17-28 $\times$ 8.8-11 μm , and cheilocystidia 18-19 $\times$ 4.4-6.6 μm with long necks. All these features are within the type description of *P. hoogshagenii*. The isotype of *P. isauri* at MICH is not *P. isauri* but also agrees well with *P. hoogshagenii*; thus this collection was part of the type of *P. caerulipes* var. *gastonii*. On the other hand, the study of the type of *P. isauri* (at LIL), shows that this species is synonym with *P. yungensis* as will be discussed in more detail later. *P. caerulipes* (Peck) Sacc. is of course a distinctly independent species, belong to Section *Semilanceatae*, because of the ellipsoid or subellipsoid more or less thin walled spores which are never subrhomboid.

There is some confusion concerning the type material of *P. hoogshagenii* in the PC Herbarium. Heim & Wasson (1958) selected as the type "Hoogshagen & Cabrero, Jul. 14, 1958"; Heim in 1959 did not mention any type. However in the PC Herbarium there are only two collections from the type locality, both made by Cabrero & Hoogshagen on Jul. 14, 1958, one of them being mixed with *P. mexicana*, now labeled "B". The type is that collection not mixed, now labeled "A".

Heim and Cailleux (in Heim & Wasson, 1958) made cultures of *P. hoogshagenii*; the cultural features thus observed are not so different from those observed in *P.*

semperviva Heim & Cailleux (see discussion of *P. hoogshagenii* var. *convexa* Guzmán).

The name of the species is in honor of S. Hoogshagen, an anthropologist who helped Dr. Heim and Mr. Wasson in their explorations for hallucinogenic mushrooms.

SELECTED ILLUSTRATIONS. Heim & Wasson (1958, pl. XXIII, figs. 1-2); Heim *et al.* (1967, pl. VIII, figs. 14-20); Guzmán (1978d, p. 113).

27. *Psilocybe hoogshagenii* Heim var. *convexa* Guzmán, var. nov.

P. semperviva Heim & Cailleux, *Rev. Myc.* 23: 352, 1958. Figs. 131-139 & 721

A var. typus differt pileus convexus vel subcampanulatus vel subpapillatus. Spor. pleurocystidiis et cheilocystidiis ut in var. typus. Pratenis ad terram subtropical. Prope Necaxa, Puebla (Mexico) (Sept. 10, 1960), Guzmán 4150 (Typus ENCB).

Pileus convex to subcampanulate or sometimes subpapillate, 5-15 mm diam. The rest of the features macroscopically and microscopically are the same as the type variety. The type variety is distinguished by its acute papilla.

HABITAT AND DISTRIBUTION. Solitary or in small groups on soil, in grasslands. Known only from Mexico from the States of Hidalgo, Oaxaca and Puebla (very common in this last State). Fruiting from June to August.

STUDIED MATERIAL. MEXICO, State of Hidalgo, Road Pachuca to Tampico, near Tlalchinol, Pérez s.n. (Aug. 6, 1978) (ENCB). State of Oaxaca, Huautla de Jiménez region, Guzmán 1652 (ENCB). Culture in PC: Cailleux & Heim (Type of *P. semperviva*, PC) and other collections from Paris (cultures), as *P. semperviva*: 46, 777 & 5024. State of Puebla, southeastern of Necaxa, Guzmán 2116; 2117; 2118; 2119; 4150 (all in ENCB); 2611 (Type, ENCB; Isotype NY); Urzua s.n. (Jun. 28, 1959) (ENCB).

DISCUSSION. The convex to subcampanulate, non-papillate pileus (very rare sub-papillate) is the main feature distinguishing this variety from the type. The fruit body is very similar to *P. mexicana* Heim; sometimes it is difficult to separate one from the other in the herbarium material, but in the field it is possible because *P. hoogshagenii* var. *convexa* has a more brownish color and a thicker stipe.

As the author stated (1978c) *P. semperviva* Heim & Cailleux is a synonym of the variety described here. *P. semperviva* was described (Heim & Cailleux, 1958; and in Heim & Wasson, 1958) as a mutant of a *P. mexicana* culture. But later Heim *et al.* (1967) reported it as a wild mushroom from Huautla de Jiménez (!). The study of the type of *P. semperviva* and other collections in PC (Cailleux & Heim 46; 777 & 5024) show a fungus with convex to subcampanulate pileus, or subpapillate but not strongly papillate, with spores, pleurocystidia and cheilocystidia as those of *P. hoogshagenii* var. *convexa* Guzmán. It is very probably that the spore print as "*P.*

mexicana" from which the culture of *P. semperviva* was obtained was, in fact, from a specimen of *P. hoogshagenii* var. *convexa*. *P. hoogshagenii* var. *hoogshagenii* and *P. semperviva* thus differ only in the well differentiated papilla of the pileus in the former and rudimentary papilla or absent in the latter. The pileus of *P. semperviva* is convex, subumbonate or slightly papillate. This variety is also an hallucinogenic. Heim & Hofmann (in Heim & Wasson, 1958) reported psilocybin and psilocyn from it.

The name of this variety refers to the convex form of the pileus, in contrast with that of the type variety.

SELECTED ILLUSTRATIONS. Heim & Wasson (1958, pl. XVIII; pl. XXXII, fig. 6); Heim *et al.* (1967, pl. III below; pl. IV below); Ott & Bigwood (1978, fig. 18).

28. *Psilocybe jacobsoi* Guzmán, sp. nov.

Figs. 110B-112 & 720

Pileus 5-15 mm latus, conico-convexus, subumbonatus, laevis, hygrophanus, rufobrunneus vel fuscus. Lamellae adnate atropurpureae, brunneae. Stipe 23-35 × 1.5-2 mm, rufobrunneus, floccosae, albifibrillosae. Annulus subfloccosus, persistent. Spor. (4.4-) 5-6 (-6.6) × 3.8-4.4 (-6) × 3-3.4 μm, elliptical vel rhomboidae. Pleurocystidiis 16-22 × 7.7-9.9 μm, hyalinis, fusoides ventricosus vel mucronatus. Cheilocystidiis 16.5-22 × 4.4-6.6 μm, hyalinis, sublageniformis. Subhymenium caeruleum. Epicutis pilearum subgelatinosis, hyphis parallelis. Ad terram, in ripa, subtropicalis sylvia, prope La Regadera-Chichotla (regio Huautla de Jiménez), Oaxaca (Mexico), Jacobs 53 (Typus, ENCB).

Pileus 5-15 mm in diam., conic to convex, or subumbonate, expanding when mature, with an incurved to straight margin, translucent striate when moist, subviscid, even and glabrous, hygrophanous, reddish brown (sienna-fulvous) to blackish brown with age.

Lamellae adnexed, brownish to dark purple brown, with somewhat whitish edges.

Stipe 23-35 × 1.5-2 μm, cylindric, equal, hollow, reddish brown, floccose, covered by white fibrils; staining blue.

Veil well developed in young stages. Annulus present, as a white subfloccose persistent membrane.

Context thin and whitish to concolorous with the surface of the pileus, brownish in the stipe. Turning slightly blue when cut. Odor and taste not checked.

Spores (4.4-) 5-6 (-6.6) × 3.8-4.4 (-6) × 3.3-4 μm, subrhomboid in face view, subellipsoid in side view, with thick wall, brownish yellow, and with a broad germ pore.

Basidia 13-16 × 5-6 μm, 4-spored, hyaline, ventricose.

Pleurocystidia 16-22 × 7.7-9.9 μm, hyaline, abundant, fusiform-ventricose, mucronate.

Cheilocystidia 16.5-22 × 4.4-6.6 μm, abundant, hyaline, sublageniform, symmetric or asymmetric, neck short to long, 2.2-2.5 μm thick.

Subhymenium subcellular, hyaline to pale brownish yellow, with irregularly incrustated hyphae, turning blue in KOH solution. Trama regular, with parallel hyphae, hyaline to brownish, thick walled, with irregular incrustations on the walls. Epicutis a subgelatinized thin layer, with narrow (4 μ m diam.) parallel hyphae, hyaline to brownish. Hypodermium with elongated, thick walled hyphae, brownish pigment irregularly incrustated on the walls. Clamp connections present.

HABITAT AND DISTRIBUTION. Gregarious in a small group, on soil on a road side embankment, in a subtropical forest, at 1200 m elevation. Known only from the type locality; fruiting in June.

STUDIED MATERIAL. MEXICO, State of Oaxaca, Region of Huautla de Jiménez, way La Regadera to Chichotla, Jacobs 53 (Type ENCB; Isotype NY).

DISCUSSION. The well formed annulus is one of the major features for separating this species from the others of the Section. For the cheilocystidia and pleurocystidia it is close to *P. herrerae* Guzmán and *P. gonispora* (B. & Br.) Sing. but differs in the size. This species is also close to those of the Section *Stuntzae*, but the smaller spores and the presence of pleurocystidia separate *P. jacobsi* from that Section. Because it turns blue on the stipe and context this species is probably a hallucinogenic fungus.

The name of the species is in honor of J. Q. Jacobs, a friend of the author who collected the type, and who has helped gather information on the hallucinogenic mushrooms.

29. *Psilocybe lonchoporus* (B. & Br.) Horak ex Guzmán, comb. nov. Figs. 113-116

Agaricus (Naucoria) lonchoporus B. & Br., *Jour. Linn. Soc. (Bot.)* 11: 544, 1871.
Naucoria lonchopora (B. & Br.) Sacc., *Syll. Fung.* 5: 852, 1887.

Pileus 5-10 mm in diam., conic to convex, with a very acute elongated umbo, glabrous and even, tawny to brownish.

Lamellae adnexed or adnate, uniformly cinnamon brown.

Stipe 12-18 $\times$ 1-3 mm, uniform in diam. or dilated upward, stuffed then hollow, flexuous, concolorous with pileus. Veil absent in the adults.

Context not studied.

Spores 5-6 (-7) $\times$ 5-5.5 $\times$ 3-4 μ m, rhomboid or subrhomboid in face view, subellipsoid in side view, thick walled, brownish, with a broad germ pore.

Basidia 18-20 $\times$ 5-6 μ m, 4-spored, ventricose-subcylindric, hyaline.

Pleurocystidia 25-30 $\times$ 10-12 μ m, hyaline, abundant, ventricose and mucronate, the apex mucron 2-4 $\times$ 1-2 μ m.

Other microscopic features not studied.

HABITAT AND DISTRIBUTION. Gregarious on rotten wood. Known only from the type locality, in December.

STUDIED MATERIAL. CEYLON, SRI-LANKA, Berkeley & Broome 835 (A) (Species No. 225) (K Type).

DISCUSSION. This species is close to *P. ochreate* (B. & Br.) Horak ex Guzmán, but it differs in spore size (7.5-8 $\times$ 5-6 $\times$ 4.5-5 μ m in *P. ochreate*). Berkeley and Broome (1871) considered *P. ochreate* as a possible variety of *P. lonchoporus* because they wrote in *Agaricus (Naucoria) lonchoporus* No. 835*** that "is a variety with a broader, paler pileus and stem, and broader gills", but in *Agaricus (Psathyra) ochreate* they based their description on the specimen No. 835****, that here it is considered as 835-B and as the type of *Psilocybe ochreate*. The few microscopic features discussed here are based on Horak's notes which he kindly sent to the author. Horak proposed in his notes the combination in the genus *Psilocybe*.

The name of the species means that the fungus resembles a spear (*lonchus*, is spear, and *phorus* to carry), referring to the shape of the pileus.

30. *Psilocybe mammillata* (Murr.) Smith *Mycologia* 40: 700, 1948. Figs. 140-148

Atylospora mammillata Murr., *Mycologia* 10: 24, 1918.
Psathyra mammillata (Murr.) Murr., *Mycologia* 10: 33, 1918.
Atylospora cinchonensis Murr., *Mycologia* 10: 24, 1918.
Psathyra cinchonensis (Murr.) Murr., *Mycologia* 10: 33, 1918.

Pileus (5-) 10-13 (-15) mm in diam., conic to campanulate, or umbonate, not expanding, glabrous, even or slightly striate when moist, hygrophaneous, reddish brown, brownish olivaceous, fulvous-badius, fading to fulvous, beige, dirty ochraceous yellow, from the disc to the margin, sometimes remaining blackish.

Lamellae adnexed, paler brownish to dark violet brown, very thin, sometimes with whitish edges.

Stipe (15-) 20-30 $\times$ 1-2 mm, cylindric, equal, or somewhat subbulbous, whitish to yellowish when young, reddish brownish at maturity, with whitish spots toward the base; with whitish mycelium at the base. Both pileus and stipe becoming slightly bluish to blackish.

Veil not well developed in the adults, whitish fibrillous, and sometimes remaining as appendiculate teeth along the pileus margin.

Context pliant, pale brownish in the pileus, reddish brown in the stipe. Odor and taste slightly farinaceous. Turning blue when cut.

Spores (4.9-) 5.5-6.5 (-8) $\times$ 4.4-5.5 $\times$ 3.5-4 μ m, rhomboid to subrhomboid or subtriangular in face view, subellipsoid in side view, walls thick, brown to yellowish with a broad germ pore.

Basidia 4-spored, 13-15 $\times$ 5-6 μ m, hyaline, subventricose.

Pleurocystidia absent (or similar to cheilocystidia near the edge of the gill).

Cheilocystidia 12-17 $\times$ 4-5.5 μ m, abundant, forming a sterile band, hyaline, fusoid-ventricose with long necks 3.3-5 $\times$ 1-2.5 μ m.

Subhymenium hyaline to brownish or brown-orangish, with elongated hyphae not incrustated, 3.3-5.5 μ m diam. Trama parallel, brownish to orangish brown hyphae thick walled, 5-15 μ m diam., irregularly incrustated. Epicutis differentiated as a subgelatinous, thin layer of subhyaline to brownish-orange, incrustated hyphae. Hypodermium with elongated thick walled hyphae, irregularly incrustated on the walls. Clamp connections very common.

HABITAT AND DISTRIBUTION. Solitary or gregarious in small groups, rarely caespitose, on clay soil or very rotten wood, with or without mosses, sometimes in humus, along trails or shady banks, inside of subtropical or tropical forests, or in coffee plantations, from sea level to 1800 m elevation. Known from Florida (U.S.A.), Jamaica, Mexico (States of Veracruz and Oaxaca), and Bolivia. Fruiting in July and August in Mexico and U.S.A. and December-January in Jamaica and Bolivia.

STUDIED MATERIAL. U.S.A., Florida, Highlands Hammock State Park, *Thiers* 5067 (SFSU).

JAMAICA, Cinchona, *Murrill* 608 (NY Type); *Murrill* 575 (NY Type of *Atylospora cinchonensis* Murr.); *Dennis* J7 (K no vidi).

MEXICO, State of Oaxaca, road Oaxaca City to Puchutla, La Calera, *Arroyo & Herrera* (MEXU 3951 as *P. cordispora*). State of Veracruz, West of Minatitlán, North of Cosolacaque, *Guzmán* 17253 (ENCB).

BOLIVIA, Dept. La Paz, Prov. Nor-Yungas, Coroico, *Singer* B-1089 (BAFC as *P. plutonia* var. *minor* Sing., nom nud.).

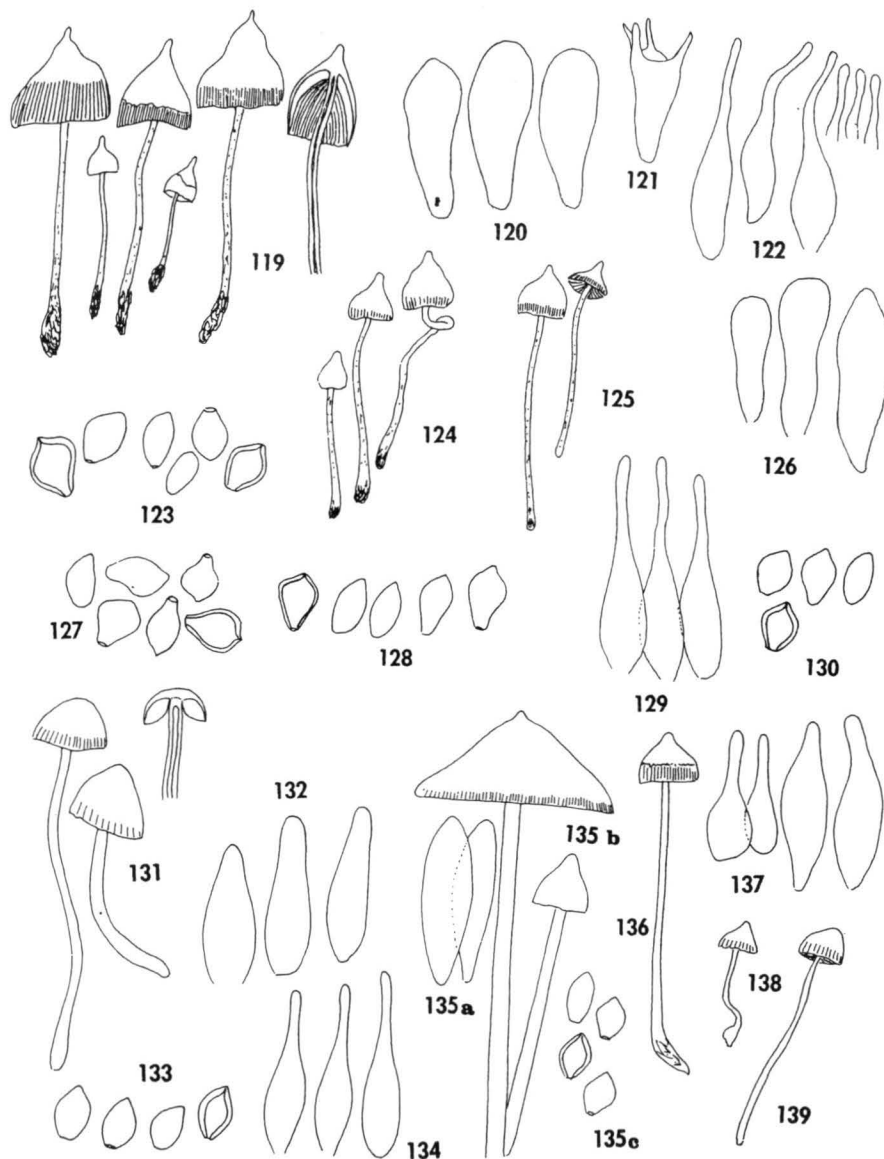


Plate 17: Figs. 119-139. - *Psilocybe hoogshagenii* var. *hoogshagenii* & *P. hoogshagenii* var. *convexa*. - 119-130: *P. hoogshagenii* var. *hoogshagenii*, 119: Carpophores, 120: Pleurocystidia, 121: Basidium, 122: Cheilocystidia, 123: Spores, 124-125: Carpophores, 126: Pleurocystidia, 127-128: Spores, 129: Cheilocystidia, 130: Spores (119 & 128-130: Guzmán SA-1501; 120-123: type of *P. caerulipes* var. *gastoni*). 131-139: *P. hoogshagenii* var. *convexa*, 131: Carpophores, 132: Pleurocystidia, 133: Spores, 134: Cheilocystidia, 135A: Pleurocystidia, 135B: Carpophores, 135C: Spores, 136: Carpophores, 137: Cheilocystidia, 138-139: Carpophores (131-134: type; 135A-C: type of *P. semperviva*; 136: Guzmán 2116; 137: Guzmán 2117; 138: Guzmán 2119; 139: Guzmán 2118).

DISCUSSION. A species close to *P. fagicola* var. *mesocystidiata* Guzmán because of its cheilocystidia and the spores, but the long, well developed pseudorhiza in that species separate well both taxa. It is also close to *P. yungensis* Sing. & Smith, *P. plutonia* (B. & C.) Sacc. and, *P. hoogshagenii* Heim, but the presence of pleurocystidia in these species distinguishes them from *P. mammillata*. The collection from Bolivia is new record. This species was described from Jamaica (Murrill, 1918). Guzmán and Thiers (1978) reported *P. mammillata* from Florida (U.S.A.). The specimen from Mexico (Arroyo & Herrera, MEXU 3951) was first reported by Guzmán (1978c) as *P. cordispora* Heim, but the short cheilocystidia separate this material from that species. Guzmán & Pollock (1979) reported *P. mammillata* from Mexico based in the collection from Veracruz. Dennis (1968) reported *P. mammillata* from the type locality with cheilocystidia 20-25 × 5-6 µm forming a white sterile band along the gill edge, and spores 6-7 × 4.5-5 × 3.5 µm. This species is very probably a hallucinogenic mushroom because it turns blue and has a farinaceous taste and odor and for its strong relationship to other hallucinogenic fungi. However, neither chemical nor cultural studies have been made on it.

The name of the species describes the papillate pileus so conspicuous in this fungus.

SELECTED ILLUSTRATIONS. Dennis (1968, Fig. 12).

31. *Psilocybe ochreate* (B. & Br.) Horak ex Guzmán, comb. nov. Figs. 117D-118

Agaricus (*Psathyra*) *ochreateus* B. & Br., *Jour. Linn. Soc. (Bot.)* 11: 555, 1871.

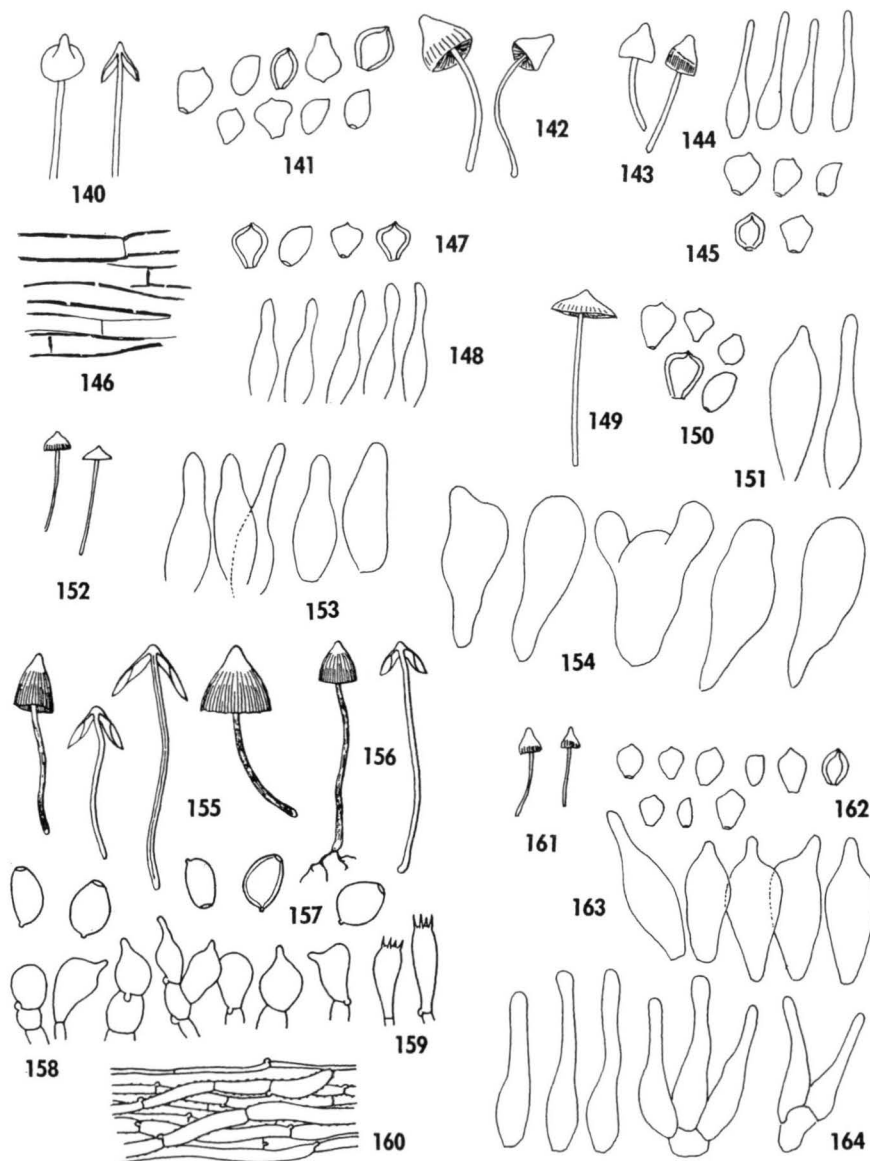
Psathyra ochreate (B. & C.) Sacc., *Syll. Fung.* 5: 1064, 1887.

Pileus 8-22 mm in diam., conic to subcampanulate, umbonate or subpapillate, glabrous and even, but somewhat striate at the margin when moist, hygrophanous, grayish ochre, brown, buff or brownish.

Lamellae adnexed, dark purple, with the edges of the same color.

Stipe 10-30 × 1-2 mm, equal, flexuous, hollow, glabrous, whitish to brownish. Veil inconspicuous in the adults.

Plate 18: Figs. 140-164. - Several species of *Psilocybe*. 140-148: *P. mammillata*, 140: Carpophores, 141: Spores, 142-143: Carpophores, 144: Cheilocystidia, 145: Spores, 146: Trama, 147: Spores, 148: Cheilocystidia (140-141: type; 142: type of *Atylospora cinchonensis*; 143-145: Guzmán 17253; 146: type; 147-148: Thiers). 149-154: *P. plutonia*, 149: Carpophores, - 150: Spores, 151: Cheilocystidia, 152: Carpophores 153: Cheilocystidia, 154: Pleurocystidia (149-151: type; 152-154: Singer B-10396). 155-160: *P. papuana*, 155-156: Carpophores, 157: Spores, 158: Cheilocystidia, 159: Basidia, 160: Pileus (all from the type, except Fig. 156: Horak 72/726). 161-164: *P. schultesii*, 161: Carpophore, 162: Spores, 163: Pleurocystidia, 164: Cheilocystidia (all from the type).



Spores $7.5-8 \times 5-6 \times 4.5-5 \mu\text{m}$ subrhomboid in face view, subellipsoid in side view, thick walled, brownish with a broad germ pore.

Basidia not studied. Pleurocystidia probably absent. Cheilocystidia not seen. Most of the elements of the hymenium and subhymenium are collapsed.

HABITAT AND DISTRIBUTION. On rotten wood, probably subgregarious. Known only from Sri Lanka (Ceylon).

STUDIED MATERIAL. CEYLON, SRI LANKA, Peradenya, *Broome 835-B* (Species No. 281) (Type K).

DISCUSSION. An insufficiently known species but considered here, because it is one of the few records of *Psilocybe* from Sri Lanka. Probably belong to Sections *Cordisporae*, or *Brunneocystidiatae*, or *Psilocybe* but we need to know the pleurocystidia and cheilocystidia, if it is bluing probably is an hallucinogenic fungus. See discussion of *P. lonchophorus*. Pegler (1977) considered this species a synonym of *P. goniospora* (B. & C.) Sing. without any explanation. But as was discussed the spores of that species are $5.6-6.6(-7) \times 4.9-5.5(-6) \times 3.8-4.4 \mu\text{m}$ as was observed in the type. The few microscopic observations presented here are based on Horak's notes, which were kindly sent to the author. Horak proposed the combination in *Psilocybe* of Berkeley and Broome's species.

The name of the species is in connection with the pale or ochre color of the pileus.

32. ***Psilocybe papuana*** Guzmán & Horak *Sydowia* 31: 49, 1978. Figs. 155-160

Pileus 10-20 mm in diam., conic to subconvex, or subumbonate, even above, densely striate for about 2/3 from the apex when moist, glabrous, dry, hygrophanous, brown to black-green or deep olive green, fading to brownish in aged carpophores.

Lamellae adnexed or subadnexed, densely crowded, brownish grey or pale brown when young, turning cocoa brown or brown in mature specimens, often with purplish tinge, staining greenish when bruised, edge fimbriate and whitish or concolorous with the faces.

Stipe 35-55 $\times$ 1-1.5 mm, cylindric, equal or subbulbous at base, hollow, dark brown below, pale brown towards apex, covered with white appressed fibrils from the veil, dry, base often with mycelium or short white rhizoids. Stipe turns green in aged carpophores or when bruised.

Veil poor developed, as a white fugacious cortina, but a distinct annulus absent.

Context pale green or blackish green in pileus, brown in stipe especially towards base. Odour and taste mild or acidulous. Chemical reaction on pileus: KOH and HCl negative.

Spores 5.5-7 (-8) $\times$ 4.5-6 $\times$ 3.8-4.5 μm , subrhomboid in face view, ellipsoid in profile view, yellowish brown, thick-walled with a broad flattened germ pore.

Basidia 13-22 $\times$ 4.5-6.5 μm , 4-spored, hyaline, ventricose to clavate.

Pleurocystidia absent.

Cheilocystidia (6.5-) 10-18 $\times$ 6.5-13 μm , subglobose to broadly fusoid, often with irregular short neck 2.5-4.6 $\times$ 2.5 μm , hyaline, thin-walled, abundant, forming a sterile gill edge.

Subhymenium subhyaline, formed by elongated hyphae irregularly encrusted with yellowish pigment on the walls, which reacts pale blackish blue (amyloid) in Melzer solution. Trama regular, with hyaline more or less parallel hyphae, somewhat incrustated on the walls. Epicutis as a thin layer composed of partly gelatinized parallel narrow hyphae, membranes encrusted with yellowish pigment. Hypodermium of cylindrical to globose cells, walls hyaline of brownish, irregularly incrustated. Clamp connections present.

HABITAT AND DISTRIBUTION. Gregarious in small groups, occasionally also solitary, on soil or among litter in tropical or subtropical-mountain forests under *Castanopsis*, *Lithocarpus* on *Nothofagus*, at 1000-2400 m elevation. Known from Papua, New Guinea only (collected in December).

STUDIED MATERIAL. PAPUA, NEW GUINEA, Eastern Highlands, Mt. Michael, Frigano, Hut Track, *Horak* (Type ZT 71/385; Isotype ENCB). Kassem Pass, *Horak* (ZT 72/726).

DISCUSSION. This species is close to the hallucinogenic American species *P. caerulescens* Murr., but the shape and size of the spores and cheilocystidia clearly separate the two. Because of the apparent bluing of the context, *P. papuana* is probably an hallucinogenic mushroom.

The name of the species refers to the type locality.

33. ***Psilocybe plutonia*** (B. & C.) Sacc. *Syll. Fung.* 5: 1056, 1887.

Figs. 149-154 & 702

Agaricus (*Psilocybe*) *plutonius* B. & C., *Jour. Linn. Soc. (Bot.)* 10: 292, 1868.

Pileus 5-15 (-25) mm in diam., conic to convex, then campanulate to expanded, with a small acute papillae or umbo, lubricous, not viscid, glabrous and even, but slightly transparently striate or sulcate, young stages with silky pallid fibrils all over the surface which later disappear, hygrophanous, reddish brown to yellowish brown or clay color, becoming black.

Lamellae adnexed, sometimes with a decurrent tooth, very thin, light brown to dark violet brown or concolorous with pileus; almost black when mature; with whitish edges.

Stipe (18-) 25-40 (-50) $\times$ 0.5-1.5 mm, equal or slightly enlarged at the base, flexuous, hollow, dark brown or reddish brown, apex pruinose, closely zoned with appressed, minute whitish fibrils.

Veil cortinate, with fibrils white covering the gills in young stages. No annulus formed.

Context brownish in pileus or reddish brown in stipe, inodorous. Taste not tested.

Spores (3.7-) 4.5-6 (-6.7) $\times$ 4.5-5.2 $\times$ 3-4 μ m, rhomboid or subrhomboid in face view, subellipsoid in side view, brownish, thick walled (1.5 μ m), and with a broad truncate germ pore.

Basidia 11-17 $\times$ 5-6.6 μ m, 4-spored, ventricose or subcylindric, hyaline.

Pleurocystidia 17-26 (-30) $\times$ 8.8-12 μ m, hyaline, thin walled, broadly ventricose or ventricose-mucronate, also obpyriform with narrow bases and frequently irregularly globose.

Cheilocystidia 12-17 (-30) $\times$ (3.5-)5-6 μ m, no so abundant, making the edge heteromorphic, fusoid to narrowly ampullaceous with obtuse tips, sometimes lageniform with more or less long necks 1.5-3 μ m diam.

Subhymenium not well differentiated from the trama, seemingly subcellular with short elements, and with yellowish brown pigment irregularly incrusting on the thin walls. Trama regular, but hyphae not strictly parallel, somewhat incrusting, with yellowish brown or reddish brown pigment, not very thick walled. Epicutis not gelatinized, but formed by hyaline filamentous hyphae, 1-2 μ m thick. Hypodermium subcellular, strongly incrusting on the walls by granular pigment dark brownish of broad and thick walled hyphae. Clamp connections present.

HABITAT AND DISTRIBUTION. Solitary or in small groups on rotten wood or on soil, containing decomposing woody material, in tropical forests, generally at sea level or in lower lands. Known from Cuba, Venezuela and the Amazon zone (Brazil). Fruiting in June to September in Cuba and Venezuela and in February in Brazil. The Venezuelan material mentioned here (not seen by the author) was collected by Dennis (1961; 1970) at 800 m of elevation, probably in a subtropical forest.

STUDIED MATERIAL. CUBA, San José (*Fungi Cubenses Wrightinii* 77), Wright 103 (Type FH, Isotype PC).

VENEZUELA, Edo. Miranda, Guatopo, Dennis 1101 (K, no *vidi*).

BRAZIL, Amazonas, 30 km North of Manaus, Embapa, Singer B-10396 (INPA 77301) & Singer B-10641 (INPA 77302).

DISCUSSION. This species is close to *P. yungensis* Sing. & Smith, but differs in the form of the cheilocystidia and pleurocystidia. There are no reports on the hallucinogenic properties of this species, but is very probable that *P. plutonia* is a psychoactive fungus, conclusion based on the strong relationships of the species with others of the Section *Cordisporae*. Murrill (1918) and Smith (1948) studied the type. Melendez-Howell (1967) studied the spores with an electron microscope. The descriptions of Berkeley and Curtis (1868) and Saccardo (1887) are very poor. Dennis (1961; 1970) presented good illustrations in black and white and in color, respectively. The report of *P. plutonia* from the Brazilian Amazon zone is a new record for the species, and the first from a tropical rain forest.

The name of *P. plutonia* comes from the Latin words *plutonian* or *plutonic*, perhaps referring to the dark color of the fungus, similar that of the soil in connection with the plutonian theory on the origin of the earth.

SELECTED ILLUSTRATIONS. Dennis (1970, Pl. 14, Fig. 1, color); Dennis (1961, Fig. 100); Melendez-Howell (1967, Pl. XI, Fig. C, spores).

34. *Psilocybe schultesii* Guzmán & Pollock *Bol. Soc. Mex. Mic.* 13: 265, 1979. Figs. 161-164

Pileus 5-15 mm in diam., conic to subumbonate, becoming more or less plane when mature, glabrous, even, slightly striate at the margin, subviscid, hygrophanous, orange brown or reddish brown, fading to yellowish brown.

Lamellae adnexed, brownish rose to dark violet brown, edge concolorous or somewhat paler.

Stipe 20-35 $\times$ 1-2 mm, cylindrical, equal, flexuous, subcartilaginous, whitish above to reddish brown below, covered by white floccose appressed fibrils staining dark to blackish when touched.

Context thin, whitish to pale brownish, pliant. Odor and taste slightly farinaceous.

Spores (5.5-) 6-6.6 $\times$ 4.4-5 $\times$ 3.8-4.4 μ m, subrhomboid in face view, subellipsoid in side view, thick walled, yellowish brown, with a broad germ pore.

Basidia 15-22 $\times$ 6.6-8.8 μ m, 4- or 2-spored, sterigmata 3-4 μ m long, hyaline, subpyriform.

Pleurocystidia 16-24 $\times$ 6.6-8.8 μ m, hyaline, ventricose-mucronate, symmetric or asymmetric, rarely with a median constriction; sometimes with short neck 2.5-3.3 μ m diam. Generally the pleurocystidia seemed to be deformed basidia with one sterigma.

Cheilocystidia 16.5-27 $\times$ 3.3-5.5 μ m, more or less abundant, hyaline, sublageniform, frequently with long flexuous neck 1.5-3.3 μ m diam., and with a clamp connection in the base.

Subhymenium seemingly subcellular, with a yellowish brown pigment irregularly incrusting on the walls. Trama regular, with parallel thin walled, hyaline to yellowish brown hyphae, and with somewhat incrusting walls. Epicutis formed by thin subgelatinized layer of hyaline to brownish yellow elongated and flexuous hyphae, with incrusting walls. Hypodermium formed by hyaline to brownish hyphal cells, irregularly incrusting on the walls.

HABITAT AND DISTRIBUTION. Gregarious in small groups on rotten wood covered by mosses; known only from Mexico in a tropical *Quercus* forest region, at 60 m elevation. Fruiting in July.

STUDIED MATERIAL. MEXICO. State of Veracruz, West of Minatitlán, South of Jaltipan, Guzmán 17480 (Type ENCB).

DISCUSSION. *P. shultesii* is close to *P. goniospora* (B. & Br.) Sing. from Sri Lanka (Ceylon), but differs in the pleurocystidia and cheilocystidia. In that species the pleurocystidia and cheilocystidia are wider, $19.8-23 \times 8.8-13 \mu\text{m}$ the former, and $\times 5.5-7 \mu\text{m}$ later. There is not information on the properties of this species, even the bluing reaction was not noted, but it is probable based on its relationships to other species of the Section *Cordisporae*, that *P. shultesii* is an hallucinogenic mushroom.

It is interesting to note that *P. schultesii*, together with *P. armandii* are the only species of *Psilocybe* known from the tropical *Quercus* forests of Mexico, an ecological region with many endemic species.

The name of the species is in honor of Dr. R.E. Schultes for his valued ethnomycological work on the hallucinogenic Mexican Mushrooms in 1939.

SELECTED ILLUSTRATIONS. Guzmán & Pollock (1979, Fig. 2).

35. *Psilocybe subyungensis* Guzmán *Mycotaxon* 7: 249, 1978.

Figs. 165-168

Pileus about 10 mm in diam., conic to subpapillate, glabrous, even but somewhat striate at the margin, subviscid to dry, hygrophanous, reddish brown or brown, fading to yellowish, but staining blue to blackish where injured.

Lamellae adnate or adnexed, violaceous brown, edges concolorous or sometimes whitish and subfloccose.

Stipe about $35 \times 1 \text{ mm}$, equal, cylindrical, hollow, reddish brown to darker toward the base, covered with appressed silky floccose whitish fibrils, principally at the base.

Veil as rudimentary cortina, fugacious in the adult stage.

Context brownish, turning blue. Odor and taste not known.

Spores (4.4-) 5-6 (-7) $\times$ (4-) 4.4-5.5 (-6) $\times$ 3.3-4 μm , rhomboid in face view, sub-ellipsoid in side view, brownish yellow, with a thick wall, a distinct broad germ pore, and with a short basal appendage.

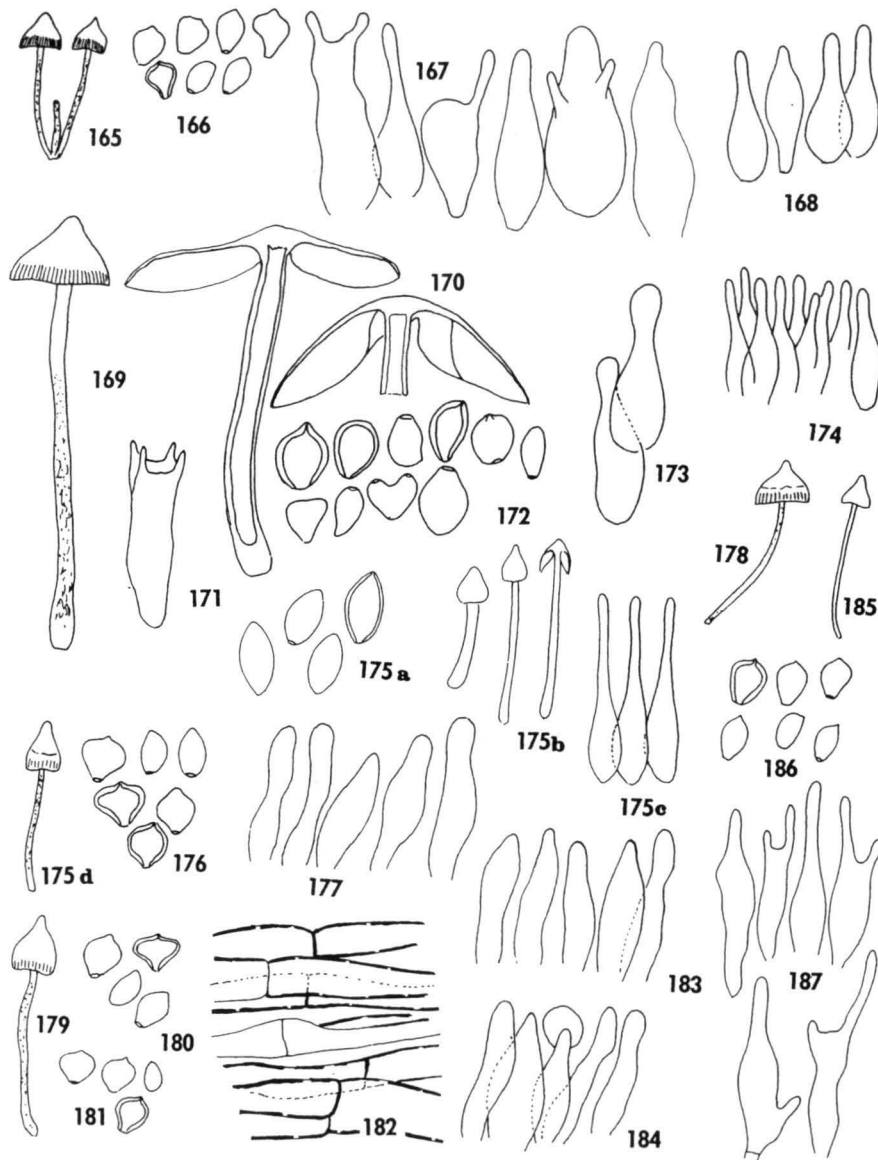


Plate 19: Figs. 165-187. - Several species of *Psilocybe*. 165-168: *P. subyungensis*, 165: Carpophores, 166: Spores, 167: Pleurocystidia, 168: Cheilocystidia (all from the type). 169-175: *P. wrightii*, 169-170: Carpophores, 171: Basidium, 172: Spores, 173: Pleurocystidia, 174: Cheilocystidia (all from the type). 175A-C: *P. subfimetaria*, A: Spores, B: Carpophores, C: Cheilocystidia (all from the type). 175D-184: *P. yungensis*, 175D: Carpophore, 176: Spores, 177: Cheilocystidia, 178-179: Carpophores, 180-181: Spores, 182: Trama, 183-184: Cheilocystidia (175D-177 & 182: type; 178, 182 & 183: type of *P. isauri*; 179-180 & 184 type of *P. acutissima*). 185-187: *P. wassoniorum*, 185: Carpophore, 186: Spores, 187: Cheilocystidia (all from the type).

Basidia 10-20 $\times$ 4.4-6 μ m, 4-spored, hyaline, subventricose with a slight median constriction.

Pleurocystidia 8.8-11 $\times$ 3.8-5.5 μ m, hyaline, scanty, sublageniform or fusoid-ventricose, with a short neck, 1-2 μ m diam.

Cheilocystidia 16.5-25 $\times$ (5.5-) 7.7-12 μ m, hyaline, lageniform, fusoid-ventricose, subpyriform, clavate, ventricose with median constrictions, ampullaceous to somewhat irregularly branched, often reminding one of basidia.

Subhymenium subhyaline to brownish yellow with more or less parallel hyphae, strongly and irregularly incrustated with brown pigment on the walls. Trama regular, subhyaline or yellowish, with parallel hyphae 7-12 μ m broad, with pigment irregularly incrustated on the thick walls. Epicutis as a thin layer subgelatinized, with hyaline elongated hyphae 3-5 μ m broad. Hypodermium with elongated to globose cells, irregularly incrustated on the thick walls with brownish pigment. Some parts of the epicutis and subhymenium with blue green diffused pigment in KOH. Clamp connections present.

HABITAT AND DISTRIBUTION. Gregarious on very rotten wood in the forest. Known only from the type locality. Fruiting in July.

STUDIED MATERIAL. VENEZUELA, State of Miranda, Southwest of Macaro, near El Arado, *Dumont VE-6363* (Type MER, Isotype, NY).

DISCUSSION. This species is very close to *P. yungensis* Sing. & Smith, but the branched cheilocystidia well separate the species. *P. herrerae* Guzmán is another related species (see discussion of that). *P. fuliginosa* (Murr.) Smith is also related species, but does not have pleurocystidia. The bluing reaction in *P. subyungensis*, seen even in microscopic slides of the revived tissues, and the resemblance of this fungus with other members of the Section, suggest that it has physcotropic properties.

The name of this species refers to its strong relationship with *P. yungensis* Sing. & Smith.

36. ***Psilocybe wassoniorum*** Guzmán & Pollock *Bol. Soc. Mex. Mic.* 13: 267, 1979. Figs. 185-187

Pileus 10-20 mm in diam., conic to subcampanulate, or subpapillate, glabrous, even, transparent-striate when moist, lubricous, hygrophanous, dark reddish brown to pale brownish, when faded, ochraceous pale.

Lamellae adnexed, pale to dark violet brown, with whitish and subfloccose edges.

Stipe 30-40 $\times$ 1-2 mm equal, cylindrical, or somewhat subbulbous, hollow, reddish brown to blackish, covered by white floccose fibrils or the veil. Base with a pseudorhiza, up 10 mm long.

Veil rudimentary as whitish fugacious cortina, inconspicuous in the adults.

Context whitish in pileus, brownish to blackish in stipe. Odor and taste slightly farinaceous. Turning blue when cut.

Spores (6-) 6.6-7.7 (-8.5) $\times$ 4.4-5.5 $\times$ 3.8-4.4 μ m, subrhomboid in face view, subellipsoid in side view, thick walled, brownish yellow, with a broad germ pore.

Basidia 12-15 $\times$ 5.5-6.6 μ m, 4-spored, hyaline, subcylindric or clavate.

Pleurocystidia absent.

Cheilocystidia 14-25 (-28) $\times$ 5-6.6 μ m, abundant, forming a sterile band, hyaline, sublageniform, ventricose-rostrate or obclavate with a flexuous neck 1-2 μ m thick, sometimes irregularly branched or with two necks.

Subhymenium seemingly subcellular, with brownish pigment irregularly distributed on the walls, strongly bluing in KOH solution. Trama regular, with parallel hyphae 4-11 μ m diam., very irregularly pigmented on the walls. Epicutis as a thin subgelatinized layer of hyaline, parallel thin hyphae. Hypodermium with elongated elements, strongly and irregularly incrustated on the walls. Clamp connections present.

HABITAT AND DISTRIBUTION. Solitary or in small groups on soil, on humus or small open places of the subtropical forests (*Liquidambar* with *Quercus*), at 1700-1800 m elevation. Known only from the State of Veracruz (Mexico). Growing in June-July.

STUDIED MATERIAL. MEXICO, State of Veracruz, near Acatepec, *Jacobs 71* (ENCB). Road Naolinco to Santa Rita, near Paz de Enriquez, *Pollock 7-22-78-3* (ENCB, Type); *Jacobs 88 & 90* (ENCB).

DISCUSSION. The long pseudorhiza of this species suggests affinities to *P. fagi-cola* Heim and its var. *mesocystidiata* Guzmán, but it differs in the large cheilocystidia, the absence of pleurocystidia, and the slightly larger spores. It is also close to *P. xalapensis* Guzmán & López, but the size of the spores and cheilocystidia separate both species. It is very probable that this species is a hallucinogenic mushroom, for the bluing reaction as well as for the close relationship to other species of the Section *Cordisporae*. This species is independent of *P. wassonii* Heim a synonym of *P. muliercula* Sing. & Smith.

The name of the species is in honor of Mr. & Mrs. Wasson for their valuable ethnomycological work on the hallucinogenic mushrooms.

SELECTED ILLUSTRATIONS. Guzmán & Pollock (1979, Fig. 3).

37. ***Psilocybe wrightii*** Guzmán *Mycotaxon* 7: 251, 1978. Figs. 169-175, 650 & 704

Pileus 25-65 mm in diam., convex to subumbonate to irregularly plane, glabrous even to substriate at the margin, somewhat rimose in old specimens, viscid to subviscid, hygrophanous, brown or reddish brown to brownish yellow, fading to straw-color.

Lamellae adnate to adnexed or sinuate, yellowish violaceous to brownish violaceous or chocolate brown, somewhat mottled; edges whitish or concolorous, subfloccose.

Stipe 80-95 × 5-9 mm, cylindrical, equal or slightly subbulbous, hollow, whitish to yellowish, finally reddish brown to blackish; staining blue when touched or injured; covered by appressed floccose white fibrils toward the base.

Veil cortinate, white, rudimentary, inconspicuous in the adults.

Context white and fleshy in the pileus, yellowish and subgelatinous to subcartilaginous in the stipe; staining blue when cut. Odor and taste farinaceous.

Spore print dark violaceous-brown.

Spores (6-) 6.6-7.7 (-8.5) × 5.5-6.6 (-7.1) × 3.5-5.5 μm, subrhomboid, some obscurely angular in face view, but broadly ellipsoid or subellipsoid in side view, yellowish brown thick walled, with a broad flattened germ pore.

Basidia 20-30 × 6-8 μm, 4-spored, ventricose to pyriform, with a slight median constriction.

Pleurocystidia 15-22 × 5.5-6.6 μm, hyaline, not abundant, ventricose to fusoid, attenuate above and with a rounded apex or sublageniform, neck 3.3-4 μm across.

Cheilocystidia 13-22 × 4.5-6 μm forming a sterile band, abundant, hyaline, ventricose-rostrate, with necks 2-2.5 μm.

Subhymenium with yellowish narrow hyphae, with irregular brownish yellow pigment incrustations. Trama hyaline to yellowish, the hyphae parallel, with brownish yellow pigment irregularly incrustated. Epicutis formed by a layer of subgelatinized parallel elongated hyphae, hyaline to brownish. Hypodermium subcellular, yellowish or hyaline, with some lactiferous hyphae, hyaline or brownish 5-7 μm broad. Clamp connections present.

HABITAT AND DISTRIBUTION. Gregarious on grassy soil near the subtropical forest, at 900 m elevation. Known only from the type locality (growing in February), but it is possible that it grows in Rio de los Sosas in Province of Tucuman.

STUDIED MATERIAL. ARGENTINA, Prov. Tucuman, Tucuman to Tafi del Valle Road, 3 km West of Station Aforos, *Guzmán 8683* (Type BAFC; Isotypes ENCB & NY).

DISCUSSION. *P. wrightii* is close to *P. brasiliensis* Guzmán and *P. hoogshagenii* Heim because of their pleurocystidia, but differs in the size of them, as well as in the size of the cheilocystidia. It is also very similar to *P. caeruleus* Murr. but that species does not have pleurocystidia. The report of *P. caeruleus* by Singer and Digilio (1951) from the Rio de los Sosas, which is near to Aforos Station, may, in fact, be a record of *P. wrightii* (no material of that species was available to the author in LIL and in BAFC). It is very probable that *P. wrightii* is a hallucinogenic mushroom because of its similarities to *P. hoogshagenii* and *P. caeruleus*, as well as for the bluing and taste and odor.

The name of this species is in honor of Dr. J.E. Wright, an Argentinian mycologist, who helped the author in his trips in Argentina in the type locality.

38. *Psilocybe xalapensis* Guzmán & López *Bol. Soc. Mex. Mic.* 13: 181, 1979.

Pileus (3-) 7-10 (-12) mm in diam., conic to subumbonate, then shortly papillate, glabrous, even but finely marked with translucent striations when humid, lubricous, hygrophanous, reddish brown or chocolate brown, fading to ochraceous or pale yellowish. Staining dark blue when injured, blackish when fading in mature specimens.

Lamellae adnate to adnexed, grayish violet to dark brownish violet, with whitish floccose edges.

Stipe (26-) 35-50 (-55) × 1-2 mm equal, cylindric, flexuous, hollow, reddish brown or orangish brown to darker toward the base. Covered or mottled by appressed floccose white fibrils, mostly toward the base. Staining deep blue where injured. With an irregular flexuous pseudorhiza, up to 30 mm long.

Veil rudimentary as white cortina, soon evanescent in the adults.

Context thin, pliant, dark brown. Staining dark blue when cut. KOH stains the pileus and the stipe dark brown. Odor and taste farinaceous.

Spores 5.2-5.8 (-6.5) × 4.5-5.8 × 3.9-4.5 μm, rhomboid or subrhomboid in face view, subellipsoid in side view, with a broad germ pore, thick walled, dark yellowish brown.

Basidia 14.3-19.5 × 5.8-6.5 μm, 4-spored, hyaline, subcylindric or clavate.

Pleurocystidia absent.

Cheilocystidia 14.9-16.9 × 5.2-6.5 μm, hyaline, abundant, sublageniform, with a long and flexuous neck 2.6-3.2 μm diam., sometimes irregularly branched or bifurcated, frequently with an amorphous hyaline viscous mass at the top.

Subhymenium hyaline, formed by parallel hyphae to the surface. Trama also parallel and hyaline, with thin walled hyphae 3.9-13 μm diam. Epicutis as a subgelatinous layer, with hyaline and narrow parallel hyphae. Hypodermium with irregularly pigment and incrustated elongated hyphae, 3.9-9.1 μm diam. Clamp connections present.

HABITAT AND DISTRIBUTION. In small groups or caespitose, on humus or more frequently on clay or muddy soils, in zones where the soil has been recently removed or tumbled down, without any herbaceous vegetation, in deciduous forests with *Liquidambar* and *Quercus*. Known only from the State of Veracruz (Mexico).

STUDIED MATERIAL. MEXICO, State of Veracruz, zone of Xalapa, South of Banderilla, Cerro La Martinica, *Sosa 110* (type, ENCB; Isotype NY); *Sosa 111 & 151* (ENCB and Herb. Univ. Veracruz at Xalapa). Road Xalapa to La Joya, trail to El Rodeo, *Guzmán 17799* (ENCB).

DISCUSSION. This species is close to *P. wassoniorum* as was discussed before, and it is probably that it has hallucinogenic properties for the bluing reaction and farinaceous taste and odor. The record from El Rodeo is new.

The name of the species is taken for the Xalapa region where seems endemic.

SELECTED ILLUSTRATIONS. Guzmán *et al.* (1979, pl. IV, figs. 18-20, and pl. V, figs. 21-22).

39. *Psilocybe yungensis* Sing. & Smith *Mycologia* 50: 142, 1958.

Figs. 175D-184, 722-724

P. yungensis var. *diconica* Sing. & Smith, *Mycologia* 50: 142, 1958.

P. yungensis var. *acutopapillata* Sing. & Smith, *Mycologia* 50: 295 (Fig. 44), 1958, nom. nud.

P. isauri Sing., *Sydowia* 12: 237, 1958.

P. acutissima Heim, *Rev. Myc.* 24: 106, 1959.

Pileus (5-) 10-20 (-25) mm in diam., very rarely up to 30 mm diam., conic to campanulate, not expanding, frequently acutely papillate or mamiform; the papilla varies from a simple knob, or a obconic button-like elevation to a highly acute conic umbo, glabrous and even, finely marked with long translucent strarions when moist, subviscid, pellicle not separable, margin curved to straight, hygrophanous, deep rusty brown or dark reddish brown, orangish brown, fading to brownish yellow or dirty straw color and opaque. Staining deep blue where injured, becoming blackish when dried.

Lamellae adnate or adnexed, very narrow, crowded, grayish to brownish violet or dark brownish purple, with concolorous or somewhat paler edges.

Stipe (25-) 30-50 (-60) $\times$ 1.5-2.5 (-3) mm, cylindric, equal or subequal, gradually thickening toward the base, somewhat subbulbous, hollow, subcartilaginous, densely covered by floccose whitish appressed fibrils, but more or less glabrous in ols specimens. Surface pale brownish above to reddish brown or reddish black brown at the base. Bluing.

Veil as whitish fibrils or cortina which covering the gills in very young stages which soon disappear; remaining sometimes as whitish fibrils along the margin of the pileus and on the upper part of the stipe. No annulus formed.

Context of the pileus pliant and whitish to concolorous with the surface; in the stipe it is somewhat fibrous and whitish to reddish brown. Odor and flavor farinaceous. KOH stains the pileus and the stipe dark brown to blackish.

Spore print dark violaceous brown.

Spores (4.4-) 5-6(-7) $\times$ (3.8-) 4.4-5 (-6.2) $\times$ 3.3-4 μ m, rhomboid or subrhomboid in face view or subellipsoid in side view, thick walled, dark brownish with a broad germ pore.

Basidia 13-19 $\times$ 4.4-6.6 μ m, 4-spored, rarely 2- or 3-, hyaline, clavate to ventricose.

Pleurocystidia 14-25 $\times$ 4.4-10.5 μ m, scanty, hyaline, ventricose, often mucronate, sometimes with a viscous hyaline apical incrustations.

Cheilocystidia 14-33 (-40) $\times$ 4.4-6.6 (-7.7) μ m, hyaline, abundant, forming a sterile band, variable in form, from ventricose, ventricose-ampullaceous, or strangled to clavate, obclavate or ventricose-rostrate.

Subhymenium subcellular formed by small regular elements, hyaline but punctured by yellowish brown pigment which often breaks up irregularly incrustated the thick walls, sometimes turning blue in KOH. Trama regular, with elongated cylindric thick walled (0.8-1.5 μ m) hyphae, strongly pigmented as those of the subhymenium. Epicutis as a subgelatinized thin and inconspicuous layer, formed by thin parallel, elongated, smooth to incrustated hyphae, hyaline to yellowish brown or orangish brown. Hypodermium formed by a compact layer of elongated to subglobose hyphae, up to 16 μ m diam., all irregularly strongly incrustated with yellowish brown or orangish brown pigment; walls up to 4 μ m thick. Hyphae of the veil on the stipe elongated, thin walled, hyaline, 1.6-2.7 μ m. Clamp connections numerous.

HABITAT AND DISTRIBUTION. Solitary, more frequently gregarious or caespitose in small to large groups on very rotten wood, rare on humus containing decomposing woody material, in subtropical forests, or in coffee plantations, at 1000-2000 m elevation. Fruiting in January (in Bolivia) or in June-July (in Colombia and Mexico). Known from Mexico to Bolivia. Recently Singer (1978) reported this fungus from the Ecuador.

STUDIED MATERIAL. BOLIVIA, Provincia Yungas, road from La Paz to Coroico, Cataratas de San Juan, *Singer B-648* (Type MICH; Isotype ENCB); *Singer B-651* (Type of *P. yungensis* var. *diconica*, MICH).

COLOMBIA, Dept. Valle, Municipio Dagua, near Vergel, Finca La Araucana, *Singer B-6112* (MICH ? *no vidi*).

ECUADOR, Tungurahua, Rio Verde, *Singer B-7173* (F) (*no vidi*).

MEXICO, State of Oaxaca, Huautla de Jiménez, *Heim* 35 (PC Type of *P. acutissima*; Isotype ENCB); *Arroyo* (MEXU 2691); *Nava* (MEXU 5751); *Sabina* (MEXU 6726); *Ott* (Jul. 1, 1975 & Jul. 15, 1975) (ENCB); *Johnson 11-A* (ENCB). La Agencia (Huautla de Jiménez region), *Jacobs* 51 (ENCB). Agua Fierro (Huautla de Jiménez region), *Guzmán* 1848-8 & 1875 (ENCB); *GH-1128-B* (Type of *P. isauri* LIL, Isotype ENCB; the collection in MICH is *P. hoogshagenii*!); *Pollock* 2-76 (ENCB). Chichotla to Puente de Fierro, *Jacobs* 20 (ENCB). Rio Santiago (Huautla de Jiménez region), *Jacobs* 21 & 22 (ENCB); *Wasson X-1; X-2; X-3 & X-4* (all in PC); *Heim* 167 (culture at PC), 749; 500; 501 & Jul. 9, 1959 (all in PC). Rancho El Cura (Huautla de Jiménez region), *Guzmán* 1848-13 (ENCB). San Juan Mazatlán (Mije zone), *Lipp* 15; 19; 20 & 30 (ENCB). Road from Oaxaca City to Tuxtepec, near La Esperanza, *Guzmán* 16261 & 16709 (ENCB). State of Puebla, Municipio de Tezuatlán, Puente Colorado, *Ventura* 1948 (ENCB). State of Veracruz, San Miguel El Soldado, *Ventura* 10297 & 10299 (ENCB). Near Teocelo, *Ventura* 7343 (ENCB). Chiconquiaco to Santa Rita, near Paz de Enriquez, *Jacobs* 89 (ENCB). Santa Rita,

near Paz de Enriquez, *Jacobs 89* (ENCB). Santa Rita (Sierra de Chiconquiaco), *Herrera* (MEXU 7634). Pueblo Viejo to Paso Blanco, Municipio de Misantla (Chiconquiaco region), *Streesser-Pean 1960* (PC, *no vidi*). Municipio de San Andrés, Acatilpa, *Ventura 11576* (ENCB). Uxpanapa zone, Uxpanapa river, La Esmeralda, *Arrieta 34* (ENCB).

DISCUSSION. The synonyms presented here were discussed by the author (1978c) based on the study of all the types. *P. isauri* Sing. and *P. acutissima* Heim have the same macroscopic and microscopic features as the type of *P. yungensis*. Singer (1958a) separated *P. yungensis* from *P. isauri* only on the basis of the fibrillose floccose stipe in the former and the glabrous or subglabrous stipe in the latter, but this feature is in fact strongly variable and without taxonomic value. Regarding to Singer & Smith's variety, var. *deconica*, the distinction was based only on the variation of the papilla of the pileus, obconic in the type variety and conic in the var. *diconica*, but as it is possible to find intermediate specimens within the same populations, the author does not think this distinction is sufficient to separate both forms. The papillate pileus was the principal feature used by Heim (1959 and Heim & Wasson, 1958) to describe *P. acutissima* Heim.

This fungus is used by the Indians of Mexico as a *hongo adivinador* (= divinatory mushroom) in Huautla de Jiménez region, and Mije zone and they also call *hongo que adormece* or *hongo genio* (= soporific or genius mushroom, respectively). Heim & Cailleux (1959a, b), based on a chemical study made by Hofmann on a specimen identified as *P. yungensis* from Rio Santiago, reported that it has neither psilocybin nor psilocin. Cultures of *P. yungensis* and *P. acutissima* were made by Heim and Cailleux (in Heim & Wasson, 1958, and Heim *et al.*, 1967) at Paris. They reported in both fungi acremoniform, spiral and subvesiculose hyphae, as well as arthrospores and clamp connections. It is interesting to observe that the fruit bodies of *P. yungensis* and *P. acutissima* obtained in culture are the same in form, size and color; compare, for example, Figs. 2 and 10 of Heim *et al.* (1967).

The collection *Streesser-Pean 1960* reported by Streesser-Pean and Heim (1961) from Chiconquiaco region (Mexico), was not studied by the author. This probably belongs to another close related species according to Heim. The collection *Singer B-6112* from Colombia was also not studied by the author, but the notes of Singer (kindly sent to the author) suggest that this fungus belongs to *P. yungensis*. All the collections from the States of Veracruz and Puebla (Mexico) need to be revised, maybe they belong to *P. wassoniorum* or *P. xalapensis*.

The name of the species is based on the type locality.

SELECTED ILLUSTRATIONS. Heim & Wasson (1958, fig. 35; pl. XXII; XXIII, figs. 5-7); Heim *et al.* (1967, figs. 1-2, 10 (as *P. acutissima*), and pl. IX, figs. 1-3).

Section Psilocybe

Spores rhomboid or subrhomboid not more than 10 μm long, with thick (more than 0.5 μm) or more or less thin (not more than 0.5 μm) walls. Pleurocystidia absent. Small fruit-bodies (5-20 mm diam., rarely 30 mm diam.). Temperate species, not turning blue when handled. Type species: *P. montana* (Pers. ex Fr.) Kumm.

This Section is very close to Sect. *Cordisporae*, but differs mainly in the lack of bluing, and in its temperate distribution.

The species included are the following: 40. *P. acadiensis* Smith, 41. *P. andina* Guzmán, 42. *P. angulata* (Pers.) Sing., 43. *P. bullacea* (Bull. ex Fr.) Kumm., 44. *P. crobula* (Fr.) M. Lange ex Sing., 45. *P. inquilina* (Fr. ex Fr.) Bres., 46. *P. latisporea* Murr., 47. *P. marthae* Sing., 48. *P. montana* (Pers. ex Fr.) Kumm., 49. *P. nothofagensis* Guzmán & Horak, 50. *P. omnium-sanctorum* Sing., 51. *P. phyllogena* (Peck) Peck, 52. *P. physaloides* (Bull. ex Mér.) Quél., 53. *P. pteridophytorum* Sing., 54. *P. rhomboidespora* (Atk.) Smith ex Guzmán, 55. *P. schoeneti* Bresinsky, 56. *P. semistriata* (Peck) Guzmán, 57. *P. smithiana* Guzmán, and 58. *P. xeroderma* Huijs.

Key to the species

- 1a. Without annulus..... 2
- 1b. With annulus..... 17
- 2a. With two types of cheilocystidia, according to the age, when young small, 22-38 (-40) μm long, narrowly ventricose to subcylindric or sublageniform; in age they becoming filamentous, 50-70 μm long. Spores (5-) 5.5-6.6 (-7.7) μm long. Species known only from Nova Scotia (Canada)..... 40. *P. acadiensis*
- 2b. With one type of cheilocystidia..... 3
- 3a. Cheilocystidia subfusiform or sublageniform with or without neck, or mucronate, more than 7 μm diam., or if these are narrow no more than 7 μm diam. The veil is conspicuous along the margin of the pileus (as appendages) and the stipe is covered by squamules from the veil, or veil poor developed. . 4
- 3b. Cheilocystidia lageniform, narrow no more than 7 μm diam. with long neck. Veil not well developed, except in some of those species with thick walled spores (see 7b)..... 6
- 4a. Cheilocystidia narrow, 5-7 μm thick, sublageniform with short neck. Spores 6.6-7.5 (-8) μm long. Veil conspicuous as appendages or squamules on the stipe. Habitat variably (old rotten dung, manure soil, rotten wood or twigs or attached to grass) in open forests or lawns..... 52. *P. physaloides*

- 4b. Cheilocystidia broad, generally more than 7 μm thick, subfusiform or mucronate or sublageniform with short or long neck. Veil poor developed, no forming appendages neither squamules. Habitat on humus in forest (see also 6b). 5
- 5a. Cheilocystidia subfusiform, or mucronate, or sublageniform, 24-35 (-40) $\times$ (5-) 7-12 (-15) μm . Spores (5.4-) 6-7 (-8.4) μm long. Species known from central Europe and eastern U.S.A. 58. *P. xeroderma*
- 5b. Cheilocystidia lageniform with subflexuous neck, 21-35 $\times$ 7-13 μm . Spores (6.5-) 7-8.5 μm long. Species known only from central Europe. 55. *P. schoeneti*
- 6a. Cheilocystidia more than 40-45 μm long. Spores thick (more than 0.5 μm) walled, (5.4-) 6-7 (-7.7) μm long. Species known only from the eastern U.S.A., on leaves or rotten wood. 54. *P. rhomboidospora*
- 6b. Cheilocystidia not more than 40-45 μm long. 7
- 7a. Thin walled spores (not more than 0.5 μm thick). 8
- 7b. Thick walled spores (more than 0.5 μm). 11
- 8a. Spores (6.6-) 7.7-8.8 (-10) μm long. Cheilocystidia 18-38 $\times$ 5-8 μm . Growing on grass stems, rotten twigs, sticks or rotten wood, rarely on old dung or rich soil in open coniferous forests with grasses. 45. *P. inquilina*
- 8b. Spores (5-) 6.5-7 (-8) μm long or shorter. 9
- 9a. Cheilocystidia 25-45 μm long. Spores (5-) 5.5-6.6 (-7.7) μm long. Growing on grass stems or rhizomes, rotten twigs or logs or other herbaceous debris, or on sawdust or on old rotten dung, in lawns, or open deciduous forests (rarely in coniferous forests). 44. *P. crobula*
- 9b. Cheilocystidia 14-28 μm long. 10
- 10a. Subhymenium with diffused pigment. Spores (5-) 5.5-6.6 (-7) μm long. Cheilocystidia 14-25 μm long. Species known only from the eastern U.S.A. and central Europe. 57. *P. smithiana*
- 10b. Subhymenium with incrustated pigment. Spores (5-) 5.5-6 (-6.5) μm long. Cheilocystidia 16.5-28 μm long. Species known only from New Guinea. 49. *P. nothofagensis*
- 11a. Broad spores, more than 6 μm wide. 12
- 11b. Narrow spores, not more than 6 μm wide. 13
- 12a. Cheilocystidia short, 9-15 $\times$ 4.4-5.5 μm . Species known only from Chile. 47. *P. marthae*
- 12b. Cheilocystidia larger than 15 μm 18
- 13a. Cheilocystidia and spores smaller (19-30 μm and (4.5-) 5-6 (-6.5) μm ,

- respectively). Species known only from the eastern U.S.A., growing on pieces of grass leaves, or on sticks and debris. 46. *P. latisporea*
- 13b. Cheilocystidia and spores large, or if the cheilocystidia are smaller, the spores are more than 7 μm long. 14
- 14a. Spores small (5.5-) 6-7 (-7.7) μm long. Cheilocystidia 22-35 (-37) μm long. Pileus dry. Growing on leaves, mosses or twigs, in deciduous or coniferous forests. Known from Europe and U.S.A. 51. *P. phyllogena*
- 14b. Spores large (6.5-) 7-8.5 (-9.9) μm long. 15
- 15a. Pileus dry. Growing on dead monocotyledoneous plants or mosses. 42. *P. angulata*
- 15b. Pileus viscid. 16
- 16a. Growing on soil covered by mosses. Widespread in temperate forests in Europe and America. 48. *P. montana*
- 16b. Growing on fallen fern thallus. Known only from South America. 53. *P. pteridophytorum*
- 16c. Growing on rotten wood or standing trees. Known only from South America. 50. *P. omnium-sactorum*
- 17a. Spores (6.6-) 7.7-8.8 (-9.9) μm long. Annulus permanent. Species known only from the high mountains of Venezuela, growing on mosses. 41. *P. andina*
- 17b. Spores (6-) 6.6-7.7 (-8.2) μm long. Annulus sometimes ephemeral. Widespread species growing mainly on dung or rich soil or other materials, not on mosses (see also 18b, and *P. acadensis*, 2a, and *P. crobula*, 9a) 43. *P. bullacea*
- 18a. Spores (6.6-) 7.7-8.8 (-9.9) $\times$ 5.5-7 (-8) μm . Growing on mosses. Veil poorly developed. 56. *P. semistriata*
- 18b. Spores (6-) 6.6-7.7 (-8.2) $\times$ 4.9-5.5 (-6) μm . Growing on dung or other habitats, not on mosses. Veil well developed, forming an annulus. 43. *P. bullacea*

40. *Psilocybe acadensis* Smith *Journ. Elisha Mitchell Sci. Soc.* 12: 192, 1946.

Figs. 233-237

Pileus 10-25 mm in diam., conic, becoming obtusely campanulate to more or less plane or expanded umbonate, the margin incurved at first, glabrescent, surface with scattered white flecks of fibrils left from the veil or with a zone of flecks near the margin, even, margin striate when moist, viscid, hygrophanous, dark rusty brown when fresh, more or less ochraceous, beige, or clay-color when faded.

Lamellae broadly adnate, whitish when young, becoming violaceous brown, or purplish brown, or cinnamon-brown when dried, edges white and fimbriate.

Stipe 20-40 × 2-2.5 mm, equal above, and enlarged at the base, hollow, whitish to reddish brown, more or less covered by the white copious fibrils, base surrounded by an extensive mat of appressed white mycelium.

Veil thin and white, cortinate, forming a superior evanescent fibrillose annulus.

Context of the pileus thin, fragile, and brownish, but darker at the stipe. Odor and taste not distinctive.

Spores (5-) 5.5-6.6 (-7.7) × 4-4.9 (-6.6) × 3.3-4.4 μm, subrhomboid in face view, subellipsoid in side view, yellowish brown, thick walled, with a narrow germ pore.

Basidia (12-) 14-22 × 5-6.6 μm, 4-spored, hyaline, subclavate.

Pleurocystidia absent.

Cheilocystidia hyaline, very abundant and conspicuous, of two types, when young, 22-38 (-40) × 4.4-6 μm, narrowly ventricose to subcylindric, or sublageniform, the apex 3-4.4 μm, often with a mucilage mass at the apex; in age the cheilocystidia becoming filamentous, 50-70 × 3-4 μm, flexuous or straight, and with a clamp connection at the cross walls at the base.

Subhymenium hyaline, formed by more or less elongated hyphae. Trama parallel, pale orangish-brown, with diffused pigment or somewhat incrustated on the walls. Epicutis with a well differentiated gelatinous pellicle of hyaline hyphae 1.5-3 μm in diam. Hypodermium with interwoven brownish hyphae, with incrustated pigment. Clamp connections present.

HABITAT AND DISTRIBUTION. Scattered on decaying stems of *Epilobium*. Known only from the type locality. Fruiting in July.

STUDIED MATERIAL. CANADA, Nov. Scotia, Colchester County, Upper Brookside, *Wehmeyer 618* (MICH Type).

DISCUSSION. The two types of cheilocystidia separate this species from the others of the Section, but future studies are necessary in order to check the value of this feature. The author has observed in other species such as *P. uruguayensis* Sing. ex Guzmán, and in *P. semilanceata* (Fr. ex Secr.) Kumm. that the develop of cystidia is according to their age.

The species name refers to the old name of the type locality, *Acadia*, a French territory in the last Century.

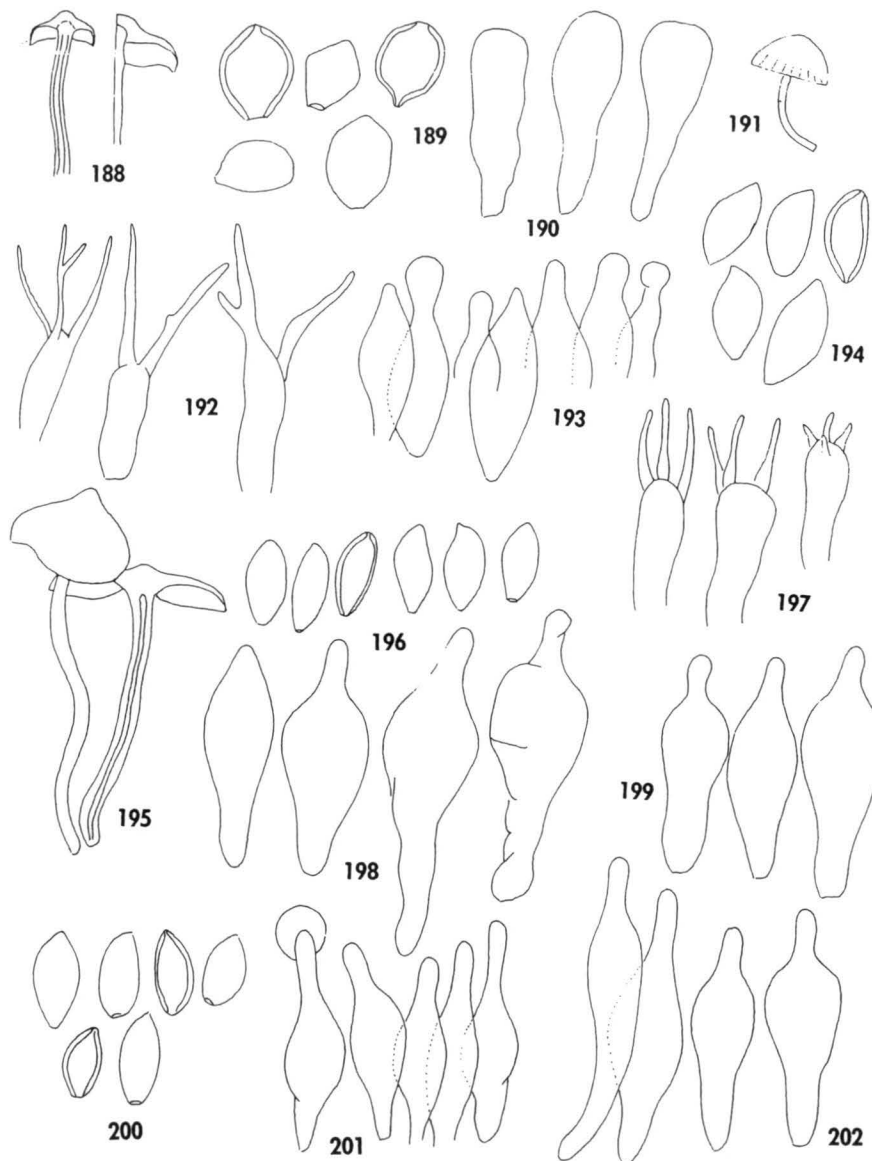


Plate 20: Figs. 188-202. - Several species of *Psilocybe*. 188-190: *P. blattariopsis*, 188: Carpophores, 189: Spores, 190: Pleurocystidia (all from the type). 191-194: *P. paupera*, 191: Carpophore, 192: Cheilocystidia, 193: Pleurocystidia, 194: Spores (all from the type). 195-202: *P. subaeruginosa*, 195: Carpophores, 196: Spores, 197: Basidia, 198: Pleurocystidia, 199: Cheilocystidia, 200: Spores, 201: pleurocystidia, 202: Cheilocystidia (195-199: type; 200-202: Watling 10387).

Pileus 5-10 mm in diam., subconic or convex to subcampanulate, glabrous, even, slightly striate by transparent at the margin when moist, subviscid or lubricous to dry, hygrophanous, reddish brown, fading to brownish, or clay color, or straw color.

Lamellae broadly adnate to somewhat short decurrent, brownish to brown-violet, with edges concolorous or whitish and floccose.

Stipe 20-30 × 0.5-1.5 mm, cylindric or attenuate towards the apex, hollow, whitish above to reddish brown below, covered with fibrils or floccose white spots.

Veil forming a well developed annulus more or less permanent, whitish, membranous to fibrillose or floccose.

Context thin, yellowish white, taste or odor slightly fungoid.

Spore print dark violaceous brown.

Spores (6.6-) 7.7-8.8 (-9.9) × 5-5.5 (-6) × 3.3-5 μm, subrhomboid or sublentiform in face view, ellipsoid or ovoid-ellipsoid in side view, with thick walls, brownish or yellowish brown and with broad germ pore.

Basidia 16-22 × 6-7 μm, 2- or 4-spored, ventricose or subpyriform.

Pleurocystidia absent.

Cheilocystidia 15-30 × 4.4-5.5 μm, ampullaceous with long neck 2-3.3 μm diam., hyaline, abundant, sometimes with a viscous drop at the apex.

Subhymenium formed by subglobose hyaline elements, strongly and irregularly incrustated with brownish yellow pigment on the walls. Trama regular, hyaline to brownish, incrustated with scarce pigment. Epicutis as a subgelatinized thin layer, formed by elongated, thin, hyaline to brownish hyphae. Hypodermium with subglobose hyaline elements, irregularly incrustated with brownish yellow pigment on the walls. Clamp connections present.

HABITAT AND DISTRIBUTION. Gregarious on soil covered by mosses (*Polytrichum*), in the high mountains ("páramos") with *Espeletia* at 3600 m elevation. Known only from the type locality. Fruiting in July.

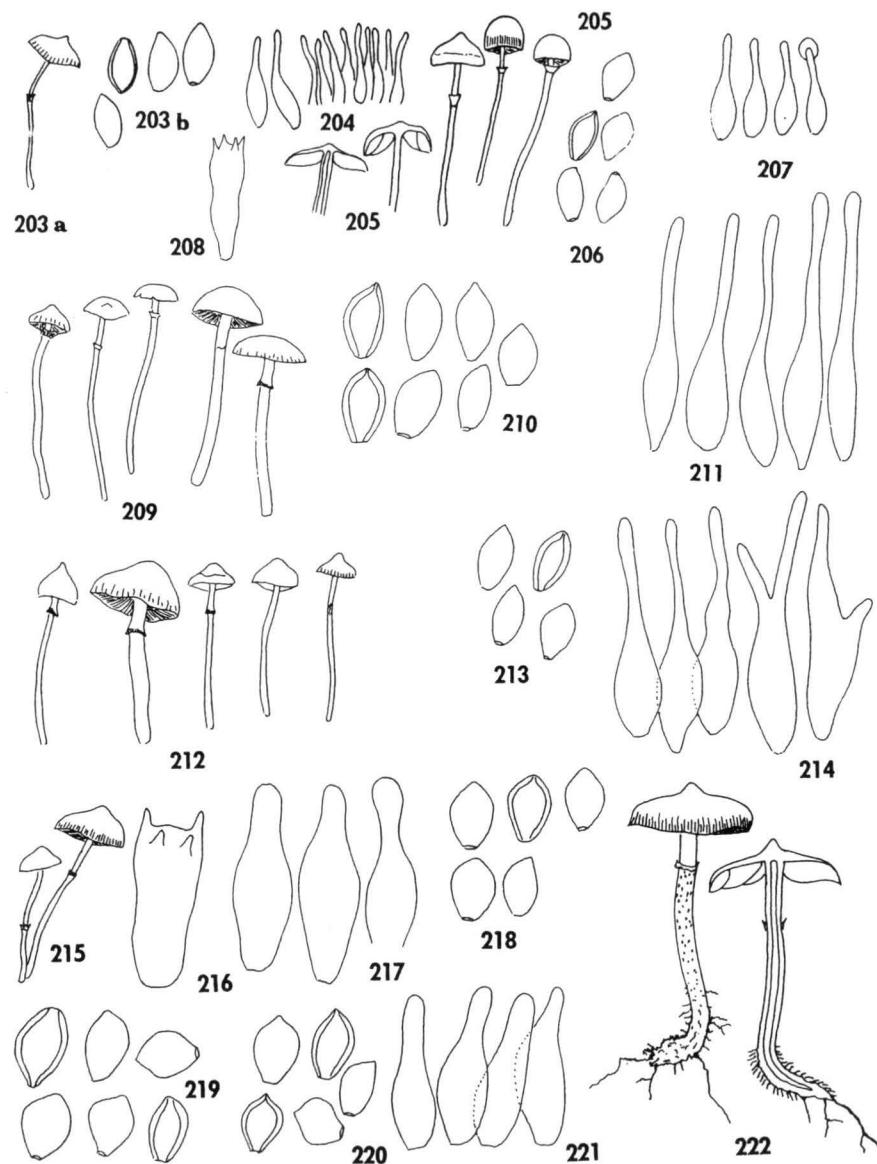


Plate 21: Figs. 203-222. - Several species of *Psilocybe*. 203-208: *P. caeruleoannulata*, 203A: Carpophores, 203B: Spores, 204: Cheilocystidia, 205: Carpophores, 206: Spores, 207: Cheilocystidia, 208: Basidium (203-204 & 208: type; 205-207: Guzmán 8877). 209-214: *P. stuntzii*, 209: Carpophores, 210: Spores, 211: Cheilocystidia, 212: Carpophores, 213: Spores, 214: Cheilocystidia (209-211: type; 212: Guzmán 16614; 213-214: Leslie 2709). 215-222: *P. subaeruginascens*, 215: Carpophores, 216: Basidium, 217: Cheilocystidia, 218-220: Spores, 221: Cheilocystidia, 222: Carpophores (215-218: type; 219 & 222: Nagasawa 8, 220-221: type of *P. aerugineomaculans*).

STUDIED MATERIAL. VENEZUELA, Parque Nacional Sierra Nevada de Santo Domingo, Laguna de Mucubaji, *Guzmán* 9232 (ENCB Type).

DISCUSSION. The well developed annulus in the adult carpophores is the principal feature distinguishing this species from *P. montana*, a very closely related species. It is also close to *P. bullacea* (Bull. ex Fr.) Kumm., but differs in the size of the spores. It is interesting to observe that *P. montana* and *P. bullacea* grow more frequently in lower and warmer lands than *P. andina*. Thus it seems that the well developed veil helps to protect the hymenium in the young stages. The same observation can be made for *Panaeolus semiovatus* (Sow. ex Fr.) Lund. ex Nannf. and *P. antillarum* (Fr.) Dennis, two very closely related species, the first with an annulus and characteristic of the high mountains and the latter without annulus and only common in tropical and subtropical meadows (see Guzmán, 1978a, and Guzmán & Pérez-Patracá, 1972).

The name of this species refers to the Andes Mountains of South America, where this species grows.

42. *Psilocybe angulata* (Batsch ex Pers.) Sing. *Perssonia* 2: 7, 1961, emend Sing. *Nova Hedwigia* 29, p. 252, 1969. Figs. 238-239

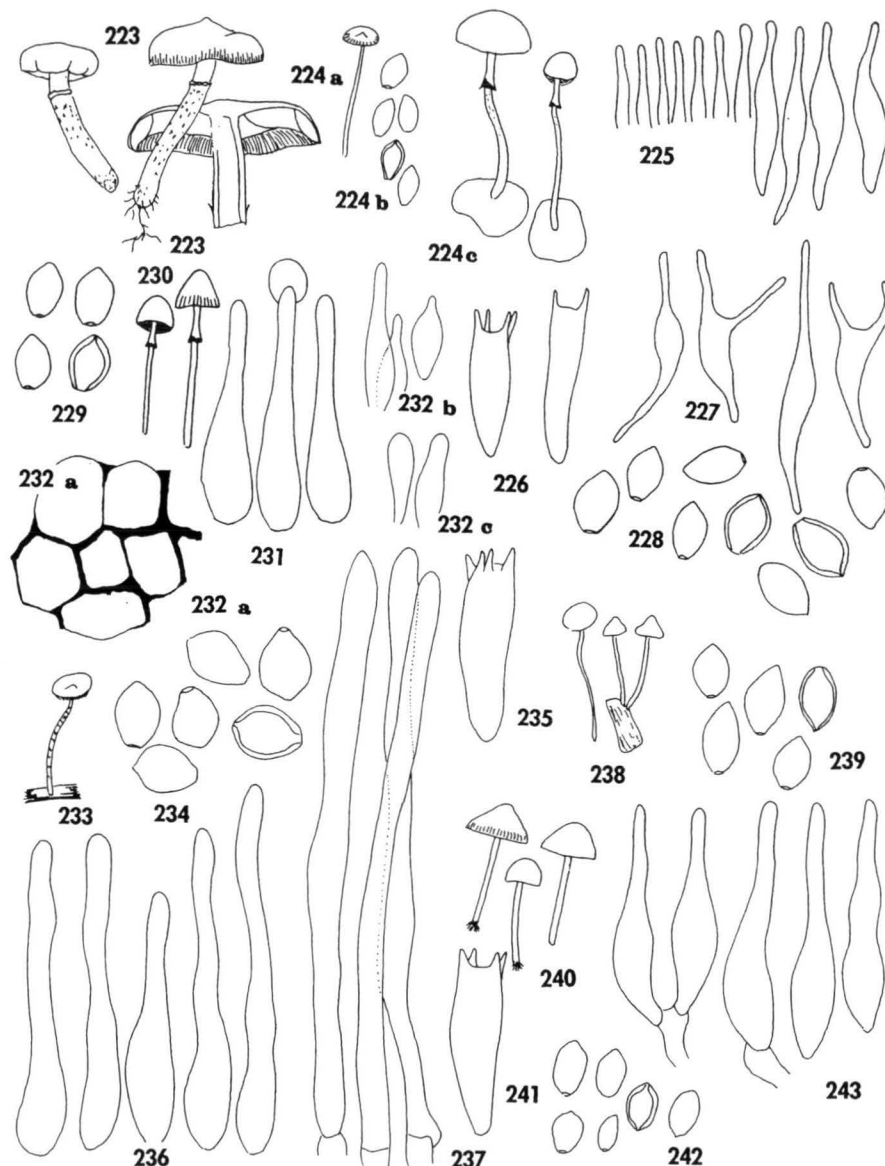
Agaricus angulatus Batsch ex Pers., *Mycol. Europ.* 3: 155, 1828.

Geophila inquilina Fr. sensu Kühn. & Romag., *Fl. Anal. Champ. Sup.* p. 339, 1953.

Pileus 10-21 mm in diam., convex or campanulate, then convex-applanate, with a small but distinct and rather consistent umbo or papilla, glabrous, even, at first moist, later one third to two fifths of radius transparently striate when moist, then slightly sulcate, not viscid, strongly hygrophanous, chestnut fulvous to chestnut brown, fading to pale brownish avellaneous, or pale brownish orange.

Lamellae adnate, light gray at first, later becoming almost concolorous with the pileus, with the edges of the same color.

Plate 22: Figs. 223-243. - Several species of *Psilocybe*. 223: *P. subaeruginascens* var. *subaeruginascens* (from Yokoyama). 224A-B: *P. chilensis*, Carpophores and Spores (type). 224C-228: *P. uruguayensis*, 224: Carpophores, 225: Cheilocystidia (young specimens), 226: Basidia, 227: Cheilocystidia (old specimens), 228: Spores (all from the type). 229-232A: *P. andina*, 229: Spores, 230: Carpophores, 231: Cheilocystidia, 232A: Trama (all from the type). 232B-C: *P. chilensis* B: Cheilocystidia, C: Pleurocystidia (all from the type). 233-237: *P. acadiensis*, 233: Carpophore, 234: Spores, 235: Basidium, 236: Cheilocystidia (young specimens). 237: Cheilocystidia (old specimens). 238-239: *P. angulata*, 238: Carpophores, 239: Spores (all from the type). 240-243: *P. bullacea*, 240: Carpophores, 241: Basidium, 242: Spores, 243: Cheilocystidia (240: Reehinger, 241-243: Reid).



Stipe 16-34 × 1-2.5 mm, equal or tapering upwards, avellaneous to concolorous with pileus, but with paler apex, fading to reddish brown or dark brown, irregularly covered by whitish fibrils.

Veil cortinate and rudimentary consisting of appressed, rather inconspicuous pallid silky fibrils.

Context very thin in the pileus, pale brownish, unchanged, inodorous.

Spores (6-) 7-8 (-9.6) × (4.8-) 5.2-5.8 (-6.8) × 4-5 μm, subrhomboid or angulate or citriform in face view, subellipsoid in side view, brown yellowish, thick walled, with broad germ pore.

Basidia 16-25 × 5.7-7 μm, 4-spored, hyaline, subventricose or subcylindric.

Pleurocystidia absent.

Cheilocystidia 10-36 × 4-9 μm, hyaline, more or less abundant, lageniform or ampullaceous, necks 5-18 × 1.8-3 μm.

Subhymenium hyaline, seemingly subcellular with short elements. Trama regular, pale brownish, with parallel hyphae. Epicutis as a hyaline thin layer of non-gelatinized cutis, consisting of filamentous hyphae. Hypodermium subcellular, with deep brown pigment, incrusting on the walls of the cells, often with voluminous globose elements which are also conspicuously incrusting. Clamp connections present.

HABITAT AND DISTRIBUTION. Solitary, gregarious or caespitose on dead monocotyledonous plants and moss thalli. Known from Central Europe and South America. Fruiting in the fall.

STUDIED MATERIAL. CHILE, Valdivia, Cordillera Pelada, 16 km western of Mirador, *Singer M-6700* (SGO).

FRANCE, *Persoon* (L 910.250.1490 Type).

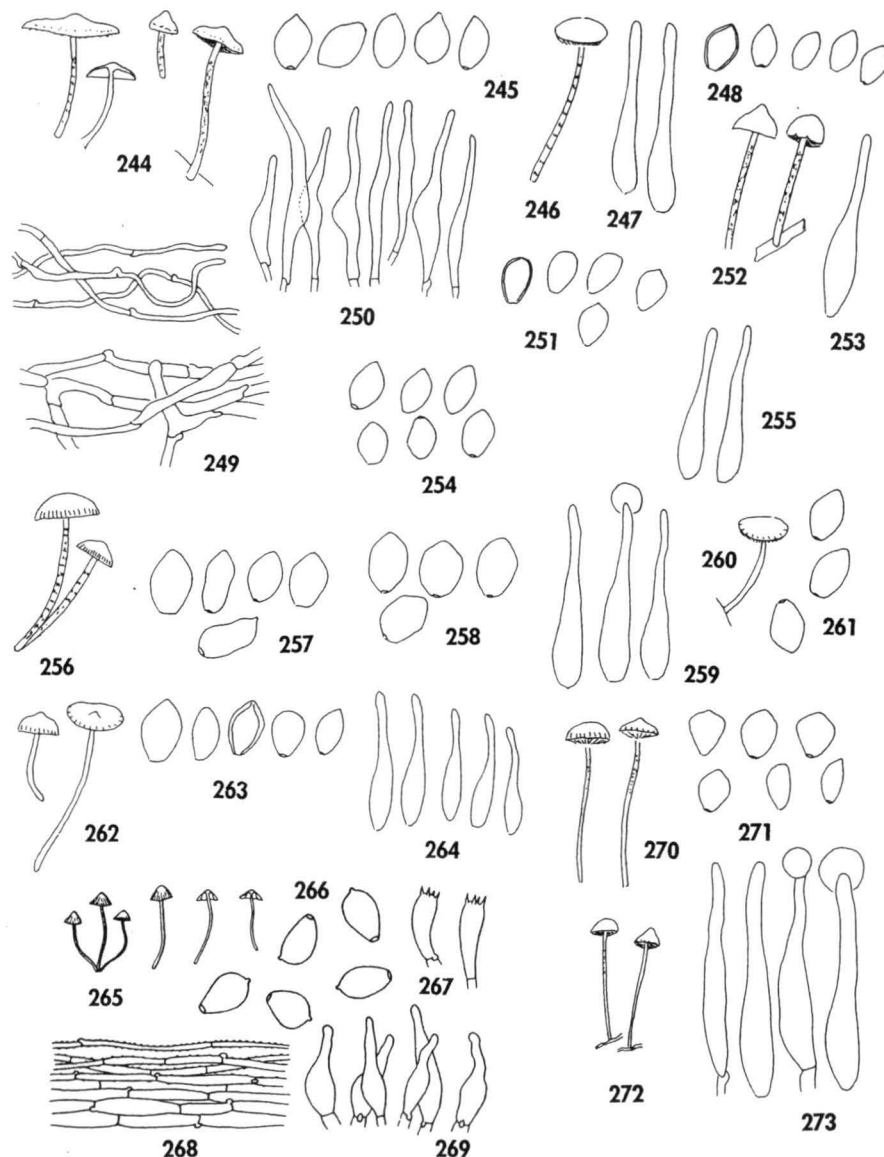


Plate 23: Figs. 244-273: - Several species of *Psilocybe*. 244-253: *P. crobula*, 244: Carpophores, 245: Spores, 246: Carpophore, 247: Cheilocystidia, 248: Spores, 249: Pileus, 250: Cheilocystidia, 251: Spores, 252: Carpophores, 253: Cheilocystidia, (244-245 & 249-250: Horak 74-404; 246-248: Lange 591; 251: Karsten 1524; 252-253 Darimont). 254-255: *P. physaloides*, 254: Spores, 255: Cheilocystidia (type of *P. caespitosa*). 256-261: *P. inquilina*, 256: Carpophores, 257-258: Spores, 259: Cheilocystidia, 260: Carpophore, 261: Spores (256: Singer M-5179; 257: Karsten 1523; 258 & 259: Singer S-530; 260 & 261: Möller). 262-264: *P. marthae*, 262: Carpophores, 263: Spores, 264: Cheilocystidia (all from the type). 265-269: *P. notofagensis*, 265: Carpophores, 266: Spores, 267: Basidia, 268: Pileus, 269: Cheilocystidia (all from the type). 270-273: *P. latispora*, 270: Carpophores, 271: Spores, 272: Carpophores, 273: Cheilocystidia (270-271: type; 272-273: Ammirati).

DISCUSSION. Singer (1961) studied Persoon's material at L herbarium and he designated this material as the type of the species. It is *Psilocybe inquilina* sensu Kühner & Romagnesi (1953). However, Bas (in a letter on Dec. 13, 1971 to the author) stated that in his and Donk's opinion, this specimen is not the type, because Persoon based his description of *Agaricus angulatus* in Batsch's description, who based his fungus in a plate of Michelli, then this means that Batsch did not see this species himself, neither Persoon. Then Mitchell's figure should be the lectotype. Bas thinks that *Agaricus angulatus* Batsch is a species of *Marasmius*.

Psilocybe angulata is close to *P. montana* (Pers. ex Fr.) Kumm., but differs in the dry pileus, and has slightly more broader spores and cheilocystidia.

The name of the species is related to the form of the spores (subrhomboid or angulate).

43. *Psilocybe bullacea* (Bull. ex Fr.) Kumm. *Führ. Pilz.* p. 71, 1871. Figs. 240-243

Agaricus bullaceus Bull. ex Fr., *Syst. Myc.* 1, p. 297, 1821.

Geophila bullacea (Bull. ex Fr.) Quél., *Enchir. Fung.*, p. 114, 1872.

Deconica bullacea (Bull. ex Fr.) Sacc., *Syll. Fung.* 5: 1058, 1887.

Pileus (5-) 10-15 mm in diam., convex to subumbonate, or subcampanulate, becoming plane or somewhat depressed at the centre, glabrous but at times the margin decorated or pellucid with very delicate remains of the veil, but soon naked, even but slightly translucent striate at the margin when moist, viscid, with a separate gelatinous pellicle, hygrophanous, dark rusty, reddish brown or chocolate brown, fading to sordid tan or pale brownish.

Lamellae broadly adnate to subsinuate or subdecurrent, dark grayish brown when in young stages to more or less chocolate brown at maturity, concolorous or somewhat whitish and fimbriate on the edges.

Stipe (10-) 20-30 (-40) × 1-1.5 (-2.5) mm, equal, hollow, tough, whitish to dark brown like the pileus, coated with a thin layer of white fibrils, to somewhat smooth.

Veil cortinate, as white arachnoid fibrils, leaving fine appressed silky fibrils, that frequently form a more or less permanent or ephemeral annulus.

Context whitish to soon concolorous with the surface, pliant and thin. Odor and taste not distinctive or slightly fungoid.

Spores (6-) 6.6-7.7 (-8.2) × 4.9-5.5 (-6.6) × 3.8-4.4 µm, subhexagonal or slightly subrhomboid in face view, subellipsoid in side view, thick walled, brown yellowish pale, with broad germ pore.

Basidia 15-22 × 5-6.6 µm, 4-spored, hyaline, subcylindric or subpyriform.

Pleurocystidia absent.

Cheilocystidia 16-25 (-35) × (3.5-) 6-5 (-7) µm, abundant, forming a sterile band,

lageniform or sublageniform, neck straight or flexuous to sometimes moniliform, hyaline, thin walled. Sometimes with a hyaline viscous drop at the apex.

Subhymenium seemingly subcellular with short elements, hyaline to brownish or cinnamon brown, with moderate amount of pigment incrustated on the walls; hyphal cells globose or elongated, 3-15 µm in diam. Trama of parallel hyphae, 6-10 µm in diam., hyaline or brownish, not incrustated, frequently with globose thin walled cells 10-20 µm in diam. Epicutis with a distinct gelatinous pellicle of hyaline elongated hyphae 2-4 µm in diam. Hypodermium with interwoven elongated to subglobose encrusted elements, pigment on the walls. Clamp connections present.

HABITAT AND DISTRIBUTION. Gregarious, rarely solitary, on dung (reported also on deer pellets), or rich soil, but also on other materials such as in cedar bogs, or on damp sacking, in grassland or fields. Fruiting in the summer. Species widespread.

STUDIED MATERIAL. U.S.A., Idaho, Granit Twin Lakes, near New Meadows, *Smith 65012* (MICH). Koniban, *Smith 67849* (MICH). Maine, Penobscot, Pushae Lake, *Homola 5666* (MAINE). Michigan, Ann Arbor, *Smith 1464* (MICH as *P. rhomboidospora*). Mich. Agric. College Campus, *Peck s.n.* (May 26, 1897) (NYS as *P. graminicola*). Tennessee, Great Smoky Mount. National Park, Indian Creek, *Hesler* (Aug. 23, 1936) (TENN 9357); *Hesler* (Jun. 18, 1944) (TENN 16391 as *P. rhomboidospora*).

COLOMBIA, Dept. Boyaca, Sagomoso-Aguazul, intersection with Aquitama road, *Dumont CO-5037* (COL; NY).

CZECHOSLOVAKIA, Radosavice, *Herink 312-44* (PRM 704016).

DENMARK, Billese, Lolland, *Möller* (23-4-37) (C).

FINLAND, Lammi, Porraskoski, *Schulmann 42* (H). Lapinlahti, Rasila, *Schulmann 54* (H). Tammisaari, *Schulmann 9* (H). Parainen, Attu, *Schulmann 191* (H).

ENGLAND, Bedfordshire, *Reid* (25-IX-60) (K; ENCB).

SWEDEN, Smaland, Femsjö, *Lundell & Nannfeldt 1149* (*Fungi Exsic. Suec.*, as *P. physaloides* UPS, PR, BPI).

YUGOSLAVIA, Peljesacc, Dalmacia, *Rechinger* (13-24-IV-30) (W as *P. merdaria*).

DISCUSSION. *P. bullacea* because of its subhexagonal spores and fimicolous habitat (at least sometimes) and the frequently present annulus, is related to the Section *Merdariae*, but it is included in Section *Psilocybe* because of the smaller spores. The length of the spores in the species of the Section *Merdariae* is up to 9 µm long. This species has been interpreted in different ways by mycologists and several times confused with *P. coprophila* (Bull. ex Fr.) Kumm., *P. merdaria* (Fr.) Ricken, *P. phylogena* (Peck) Peck, *P. rhombospora* (Britz.) Sacc., *P. physaloides* (Bull. ex Mer.) Quél., *P. rhomboidospora* (Atk.) Smith ex Guzmán, and others.

Lundell at first confused *P. bullacea* with *P. coprophila*, as is evident in the specimen 1146 of *Fungi Exsiccati Suecici* which is *P. coprophila*, first identified by Lundell as *P. bullacea*. On the other hand, the material identified by Lundell as *P.*

Pileus 5-15 (-25) mm in diam., convex to subumbonate to somewhat plane, glabrous, but in young stages the margin covered with floccose, somewhat squarrose white squamules from the veil, sometimes as short appendages then naked and shining, viscid to subviscid, cuticle separable; even but slightly striate when moist, strongly hygrophanous, umber brown, yellowish-brown, orangish-brown, or brownish, fading to yellowish tawny, beige or honey yellow.

Lamellae broadly adnate to sinuate or short subdecurrent, reddish brown or brownish to grayish brown or violet brown, with whitish, fimbriate and subfloccose edges.

Stipe 14-30 (-35) $\times$ 1-1.5 (-2) μ m, equal, flexuous, swollen at the base, hollow, dry, concolorous with the pileus or paler at the apex, much deeper colored at the base, subfloccose, mottled or banded with white fibrillose squamules from the veil.

Veil well developed as cortinate, soon evanescent and leaving on the margin of the young pileus silky, appressed, white fibrils which often agglutinate on the stipe to form a floccose subannulus usually obliterated in the adults.

Context pliant, thin and pale in the pileus, some fibrous and deep brown in the stipe. Unchanged in color when cut or dry. Odor and taste not remarkable.

Spore print grayish chocolate brown or bister-sepia.

Spores (5-) 5.5-6.6 (-7.7) $\times$ (4-) 4.8-5.4 $\times$ 3.3-4.8 μ m, subrhomboid in face view, subellipsoid in side view, pale brownish yellow, more or less thick walled (0.5 μ m) and with broad flat germ pore. Some irregular or abnormal spores observed (heart-shaped or with two pores).

Basidia 18-20 $\times$ 5-6 μ m, 4-spored, subventricose, hyaline.

Pleurocystidia absent.

Cheilocystidia 25-45 $\times$ 3-6 μ m, abundant, hyaline, forming a sterile band, sublageniform, with long filiform apice or neck 1.6-2.5 μ m diam.

Subhymenium subcellular, with short hyaline to yellowish brown elements, with pigment not markedly incrustated on the walls. Trama parallel, hyaline to brownish, with thin to thick walled (1.5 μ m) hyphae. Epicutis formed by a gelatinous layer of repent, filamentous, hyaline hyphae, 2-3 μ m diam. Hypodermium formed by hyaline to brownish elongated thin walled hyphae or globose cells, 4-20 μ m diam. Clamp connections present.

HABITAT AND DISTRIBUTION. Solitary or gregarious on grass stems or rhizomes, rotten twigs, or logs, or other herbaceous debris, or on sawdust, or on old or rotten dung, in grasslands or, more frequently, in open deciduous forests (*Quercus*, *Carya*, *Castanea*, *Fagus*, *Acer*, *Fraxinus*, etc), rarely in coniferous forests or subalpine zones, also rare in Arctic zones. Fruiting in the summer.

STUDIED MATERIAL. GREENLAND, Ivigtut, Lange 591 & 633a (C).

U.S.A., Massachusetts, Harvard, Singer & Dadmun (FH as *Deconica*). Michigan,

physaloides is *P. bullacea* (the author checked specimen 1149 of the *Fungi Exsi. Suec.*). Konrad & Maublanc (1924-1937) excluded this species.

P. bullacea is close to *P. rhomboidospora* (Atk.) Smith ex Guzmán, but that species has longer cheilocystidia (40-60 μ m long. vs. 16-25 (-35) μ m long). It is also close to *P. andina* Guzmán, only known from high mountains of Venezuela, but the spores are longer (6.6-) 7.7-8.8 (-9.9) μ m in *P. andina*, as well as the better formed annulus in that species. Quélet (1872; 1888) only distinguished *P. bullacea* from *P. coprophila* by the cortina or annulus and pratincolous habitat in *P. bullacea*, and the lack of a cortina and annulus, and the fimicolous habitat in *P. coprophila*.

Records of *P. bullacea* from Europe besides those given above are: Karsten (1876), W.G. Smith (1908), Ricken (1915), Velenovsky (1920), Bresadola (1927-1933, but see below), Pereira-Coutinho (1931), Romagnesi (1936), Lange (1939, but see below), Kühner & Romagnesi (1953, in a confused report), Heim (1957d)*, Straus (1959), Schulmann (1960), Moser (1967), Orton (1969), Pegler & Young (1971), Dennis *et al.* (1974), Urbonas *et al.* (1974), and Bresinsky & Haas (1976). From the U.S.A. there are the records of Morgan (1907) and Bigelow (1978). The records from Mexico of Murrill (1918) represent *P. coprophila* (the author has studied the NY herbarium materials). Murrill (1919) reported *Deconica bullacea* from Cuba. Guzmán (1978a) reported *P. bullacea* from Colombia. Cleland & Cheel (1918) reported this species from Australia, but Guzmán & Watling (1978) did not see any Australian material. The record from Ceylon by Berkeley & Broome in 1871: *Fungi of Ceylon* No. 277, from Thwaites No. 838, and discussed by Petch (1924), belongs to *P. pseudobullacea* (Petch) Pegler (Pegler, 1977) (See Sect. *Merdariae*). This latter author reported *P. bullacea* from Tanzania (Africa), based on Eichlbauer's paper of 1906. *P. bullacea* sensu Lange (1939) and perhaps sensu Bresadola (1927-1933) is *P. muscorum* (Orton) Moser, according to Dennis *et al.* (1974).

The epithet *bullacea* means like a bulb, referring to the form of the pileus.

SELECTED ILLUSTRATIONS. Laplanche (1894) reported Britzelmayr (Melanosp., f. 114), Bulliard (t. 566, f. 2), Cooke (t. 608 B), Krombholz (t. 3, f. 33, 34), and Patouillard (Tab. 235).

44. *Psilocybe crobula* (Fr.) M. Lange ex Sing. *Sydowia* 15: 69, 1961. Figs. 244-253

Agaricus crobulus Fr., *Epier.*, p. 199 1838.

Psilocybe simulans Karst., *Symb. Myc. Fenn.*, p. 5, 1881?

Tubaria crobula (Fr.) Sacc. *Syll. Fung.* 5: 876, 1887.

Deconica crobula (Fr.) Romag., *Rev. Myc.* 2: 244, 1937.

Naucoria crobula (Fr.) Ricken, *Vadem. Pilz.*, p. 117, 1920.

Geophila crobula (Fr.) Kühner & Romag., *Fl. anal. champ. sup.*, p. 339, 1953.

Psilocybe inquilina var. *crobula* (Fr.) Høiland, *Norw. J. Bot.* 25: 119, 1978.

*One collection at PC by Heim (15-11-64) labelled as *P. bullacea* is *Psathyrella* sp.

Ogemaw Refuge, *Smith 66881* (MICH). Mackinac County, Moran, *Smith 71957* (MICH). Emmet County, Harbor Springs, *Smith 63667* (MICH). Tennessee, Norris, *Hesler* (TEN 17033). Washington, Seattle, *Leslie 4680* (ENCB). Thurston, *Stamets 78-2* (ENCB).

BELGIUM, Prov. Luxembourg, Grandhan, Enneilles, *Darimont* s.n. (28-9-1952) (LG). Prov. Liege, Prealle, Royseaux, *Darimont* s.n. (3-IX-1950) (LG); Seraing, Vecquee, *Darimont 449, 497 & 1413* (all in LG as *Deconica inquilina*). Ben-Ahin, Ravin de Soliere, *Darimont* s.n. (5-X-1952) (LG).

CZECHOSLOVAKIA, Masar-Osade, *Hernik 437-48* (PC). Radosavice, *Herink 312-44* (PC). Hurbanove, *Fabry 6-1975* (BRA).

FINLAND, Tammisaari, *Schulmann* (3-10-1959) (H). Saaksmaki, *Schulmann* s.n. (8-VIII-1955) (H). Bomarf, Framnas, *Schulmann* s.n. (Jul. 9, 1960) (H). Tavastia australis, Tammela, Mustiala, *Karsten 1524* (H as *Agaricus inquilinus*). Forssa, Fabriksparkern, *Malmstrom* s.n. (Aug. 27, 1958) (H as *P. simulans* Karst.).

FRANCE, Outriaz, Ain, *Darimont* s.n. (22-IX-1947) (LG). Val d' Isere, Savoie, *Heinemann 3545* (BR). Coxe la Foret, *Heinemann* s.n. (Sept. 15, 1950) (BR as *P. inquilina*).

HUNGARY, Csebbharaszt, *Babos* s.n. (BP 48-446).

ITALY, Telve, Val Sugana, *Horak 74/404* (ZT).

SWEDEN, Bjorkaden, Goteborg, *Nathorst-Windahl 3553* (GB as *P. inquilina*).

SWITZERLAND, NW of Davos, Furna, *Guzmán 9681* (ENCB).

U.S.S.R., Vinotgs, *Thesleff* s.n. (18-VIII-1892) (H).

DISCUSSION. *P. crobula* is very close to *P. inquilina* (Fr. ex Fr.) Bres. and they are frequently confused for several mycologists, but as the author understand them, *P. crobula* has small spores and large cheilocystidia (see key). The habitat seems to be the same in both species. However, "classically" is considered *P. crobula* grows on rotten wood and *P. inquilina* on grass stems (Kühner & Romagnesi, 1953). Another difference is the well developed veil in *P. crobula*, which sometimes forms a sub-annulus in the young stages, but *P. inquilina* has a very poorly developed veil. Høiland (1978) considered *P. crobula* as a variety of *P. inquilina*, with spores 6-8 (-8.2) $\times$ 4.5-5.2 (-6) $\times$ 3.7-4.5 μ m. The concept of *P. crobula* followed here is more or less the same of M. Lange (based on his specimens 633a & 591 at C), in Lange (1939) and M. Lange (1955), as well as Singer's concept (1946). In the Karsten Herbarium (at H) specimen 1524 identified as *Agaricus inquilinus* agrees well with *P. crobula*, but specimen 1523 is consonant with *P. inquilina*, as based on the study of both spores and the cheilocystidia. Saccardo's description (1887) of *Tubaria crobula* (Fr.) Sacc. from Europe falls more or less within the concept of *P. crobula*, but the report of this fungus from Sri Lanka (Ceylon) (based in Berkeley & Broome, 1871) possible refers to another species, because *P. crobula* does not grow in tropical regions. *P. simulans* Karst. probable is a synonym of *P. crobula* (see doubtful species).

P. crobula is very common in Europe (Bresinsky & Haas, 1976; Darimont, 1973; Dennis, Orton & Hora, 1974; Dermek, 1977; Favre, 1960; Kühner & Romagnesi, 1953; Orton, 1969; Pegler, 1966b, Romagnesi, 1936, 1937, and Schulmann 1960). There is only one report from the north of Africa (Malençon & Bertault, 1970) and two from North America (M. Lange, 1955, and Singer, 1946).

The name *crobula* is derived from Greek and means a braid of hair gathered into a knot on the crown of the head, and refers to the squamules on the pileus.

45. *Psilocybe inquilina* (Fr. ex Fr.) Bres. *Ico. Myc.* 18, pl. 863, 1931.

Figs. 256-261 & Map 3

Agaricus (*Naucoria*) *inquilinus* Fr., *Syst. Myc.* I, p. 264, 1821.

A. (Naucoria) inquilinus var. *ecbolus* Fr., *Epicr.*, p. 199, 1836-1838.

Psilocybe ecbola (Fr.) Sing., *Nova Hedwigia* 29: 254, 1969.

Tubaria ecbola (Fr.) Sacc., *Syll. Fung.* 5: 876, 1887.

Geophila inquilina (Fr.) Kühn. & Romag., *Fl. Anal. Champ. Sup.*, p. 339, 1953.

Melanotus inquilinus (Fr.) Maire

Naucoria inquilina (Fr.) Kummer

Deconica inquilina (Fr.) Romag., *Rev. Myc.* 2: 244, 1937.

Pileus (5-) 10-15 (-20) mm in diam., convex or slightly umbonate to nearly plane, glabrous, even, but slightly translucent striate at the margin when moist, viscid to subviscid, pellicle separable, hygrophanous, reddish brown or brick brown color to yellowish brown, or tan color, or orangish or straw color; margin sometimes with some whitish floccose scales from the veil.

Lamellae broadly adnate to subdecurrent, reddish brown to grayish violet brownish or greyish brown, concolorous or with whitish edges.

Stipe 20-40 $\times$ 1.5-2 mm, equal, flexuous, hollow, whitish or pale greyish to reddish brown, slightly covered by whitish to brownish fibrils toward the base, with white mycelial felt at the base.

Veil rudimentary as white cortina soon evanescent.

Context thin and pliant in the pileus, somewhat fibrous in the stipe, brownish. Odor and taste not distinctive. KOH stains the stipe dark brown, but does not react with the pileus.

Spore print violet brown dark to blackish violet.

Spores (6.6-) 7.7-8.8 (-10) $\times$ 4.5-5.5 (-6.6) $\times$ 3.8-4.4 μ m, very rarely up to 11 μ m long, subrhomboid or subellipsoid in face view, subellipsoid in side view, with thin or somewhat thick (0.5 μ m) walls, brownish yellow, with a broad plane germ pore up to 1.5 μ m wide.

Basidia 12-30 $\times$ 5.5-9 μ m, 4-spored, very rarely 1- or 2-spored, hyaline, subventricose.

Pleurocystidia absent.

Cheilocystidia (15-) 18-38 $\times$ 5-8 μ m, abundant, hyaline, lageniform, sublageniform or subfiliform, with a long neck 2.5-3.8 μ m diam., sometimes with a hyaline viscid drop at the apex, 5-15 μ m diam.

Subhymenium hyaline to brownish, with non incrusting pigment. Trama regular, hyaline to brownish, with diffused pigment, also not incrusting. Epicutis formed by more or less a thick layer of gelatin with elongated, hyaline hyphae, not more than 4 μ m diam., somewhat incrusting with brown pigment. Hypodermium with hyaline elongated to inflated cells, 4-10 μ m diam. Clamp connections present.

HABITAT AND DISTRIBUTION. Solitary or gregarious, rarely caespitose, on grass stems, rotten twigs, sticks or rotten wood; rarely on old dung or rich soil, in open coniferous forests with grasses. Høiland (1978) reported *P. inquilina* from Norway on dead remains of *Athyrium filix-femina*, *Dryopteris filix-mas*, *Pteridium aquilinum*, *Aconitum septentrionale*, on unidentified grass, on old dung and on sawdust. He observed that the size of the fruit bodies is possibly dependent on the substrate. Large and often gregarious carpophores occurred on rich substrate (dung, sawdust, and grass-remain), and small and usually solitary fruit bodies occurred on rather poor substrates as fern remains. Guzmán observed in Orcas Island (State of Washington, U.S.A.) gregarious and large fruit bodies on soil with grass-remain.

STUDIED MATERIAL. U.S.A., California, San Francisco area, *Leslie 3008* (ENCB). Washington, North of Tenino, Nelson's Prairie, *Stamets 79-1* (ENCB). Orcas Island, *Guzmán 18602 & 18606* (ENCB).

ARGENTINA, Rio Negro, Cerro Catedral, *Singer M-5179* (BAFC). Neuquén, Nahuel-Huapi, Arroyo Frutillas, *Singer M-3637* (BAFC). Buenos Aires Prov., Parque Pereyra, *Singer S-530* (BAFC).

DENMARK, Helsingør, Möller (Dec. 20, 1941) (C).

FINLAND; *Karsten 1523* (H). Vaasa, Saudo, *Malmstpon* (10-IX 1952) (H). Borga, Nyberg (16-XI-1934) (H). Wegrund, Kasun, *Jahrdmann 138* (H). Tammsaari, *Schulmann* (12-9-59) (H).

FRANCE, Carcassonne, *Bon 2484* (Bon Herb. as *P. apiculosa*) (tentatively).

HUNGARY, Mts. Budai, Budapest-Pesthideg Kút, *Bohus & Babos* (BP 48451).

SWEDEN, Varland, Stora, *Nathorst-Windahl* (1-VIII-1958) (GB).

SWITZERLAND, Near Davos, Sertic, *Guzmán 9652* (ENCB).

DISCUSSION. This species is very close to *P. crobula* (Fr.) M. Lange ex Singer (see discussion of that species). It was Bresadola who considered the Friesian species as belonging to *Psilocybe* (Bresadola, 1931). However, a collection at W herbarium, from China (*Heinr. Frh. Handel-Mazzetti 2607-12427*) and identified by Bresadola as *P. inquilina*, is *Pholiota* sp. with smaller spores and typical chrysocystidia, as the author observed. Referring to the epithet *P. ecbola* (Fr.) Sing. used by Singer (1969) instead of *P. inquilina*, I prefer the latter. Singer stated that the concept of *Agaricus* (*Naucoria*) *inquilinus* Fr. in Fries (1821-1832, p. 264) is not specific and leaves ample room for diverse interpretations. Fries (1836-1838, p. 199) described the var.

ecbolus as a graminicolous form, but *P. inquilina* grows not only on grass stems, but on rotten twigs or wood, old dung or in rich soil. Thus, the var. *ecbolus* Fr. is considered a synonym of the type form. However the collection *Singer M-3283* (at BAFC) reported by Singer (1969) as *P. ecbola*, is *P. montana*; it has thick wall spores, 6.5-8.8 μ m long, and strongly incrusting subhymenium, and it grows on mosses. *P. inquilina* has some diverging interpretations according to different authors, as was discussed in *P. crobula*.

P. inquilina seems very common in Europe: Karsten (1876), Romagnesi (1936, 1937); Favre (1948; 1955; 1960), Kühner & Romagnesi (1953), Moser (1967), Eliade (1965), Pegler (1966), Orton (1969), Lange (1978), Lange & Lisiewska (1969), Urbonas *et al.* (1974), Watling & Richardson (1971), Dennis *et al.* (1974), Bresinsky (1977), Schulmann (1960), Bresinsky & Haas (1976), Kalamees (1978), Høiland (1978) and Jarva & Parmato (1980). Only one report exists from North Africa: Malençon & Bertault (1970). On the other hand, Saccardo (1887) reported *P. inquilina* (as *Tubaria ecbola*) from Europe and Australia. It seems there are no previous records of *P. inquilina* from North America. Singer (1969) reported it from Argentina, Chile and Uruguay. Chemical analyses made by Høiland (1978) showed no content of psilocybin in *P. crobula*.

The name *P. inquilina* means a "lodger", referring to the habitat on twigs, sticks and grass stems.

SELECTED ILLUSTRATIONS. Bresinsky (1977, pl. 1, below).

46. *Psilocybe latispora* Murr. *Mycologia* 15: 10, 1023.

Figs. 270-273

Pileus (5-) 5-15 mm in diam., convex to subumbonate or umbonate, then somewhat plane in the adults, glabrous, even, but slightly striate at the margin when moist, hygrophanous, dark grayish brown, or dull orange, or dark fuscous, then becoming ochraceous or beige or straw color on drying.

Lamellae adnate, pallid to dark fuscous or brown, edges concolorous.

Stipe 20-30 $\times$ 1-2 mm, equal, cylindric, subbulbous, hollow, pruinose at the apex, fibrillose below, with appressed whitish fibrils, surface whitish to reddish tawny, becoming fuscous.

Veil inconspicuous.

Context thin and pliant, concolorous with the pileus, with mild but unpleasant taste.

Spores (4.5-) 5.5-7 (-7.7) $\times$ 4.9-5.5 (-6) $\times$ 3.8-4.9 μ m, rhomboid or subrhomboid in face view, subellipsoid in side view, brownish or dark dull yellowish brown, thick walled, with apex truncate from an apical hyaline pore.

Basidia 16-22 $\times$ 5.5-8 μ m, 4-spored, hyaline, ventricose or subpyriform, sometimes with a median constriction.

Pleurocystidia absent.

Cheilocystidia 19-30 × 4-6.5 µm, hyaline, more or less abundant, sublageniform or narrowly ventricose, neck sometimes flexuous, with apex at times with a hyaline adhering globule of a viscous substance.

Subhymenium hyaline with brownish yellow pigment strongly or somewhat incrustated on the walls. Trama regular, hyphae parallel to somewhat interwoven, with dull yellowish brown pigment. Epicutis as a subgelatinous thin and inconspicuous layer of hyaline to pigmented with dull yellowish brown; hyphae elongated, up to 5 µm diam. Hypodermium with elongated hyphae, 5-10 µm diam. hyphae, hyaline or pigmented with dull yellowish brown. Clamp connections present.

HABITAT AND DISTRIBUTION. Single or scattered on pieces of grass, twigs or debris along roadsides or in open mixed woods; the collection from Oregon, was made on rich soil in an open place. Known only from U.S.A. (Michigan, New York, and Oregon). Fruiting in June to November.

STUDIED MATERIAL. U.S.A., Michigan, Marquette, Lily Pond, *Ammirati 5006* (MICH). New York Botanical Garden, *Earle 1462* (NY Type). Oregon, Dunes City, *Menser 4550* (ENCB).

DISCUSSION. This species is close to *P. phyllogena* (Peck) Peck but differs in the smaller spores and cheilocystidia. It is distinguished from *P. crobula* (Fr.) M. Lange ex Sing. and *P. inquilina* (Fr. ex Fr.) Bres. mainly by the thick walls of the spores. The record from Oregon is new for this species. Smith (1948) presented a study of the type of *P. latispora*; he described spores 6.2-7.8 × 4.6-5.2 × 6-6.2 µm, and cheilocystidia 22-26 × 4-7 µm.

The name of the species is for the wide spores, which are typical in all the Section.

47. *Psilocybe marthae* Sing. *Nova Hedwigia* 29: 255, 1969.

Figs. 262-264

Pileus 19-20 mm in diam., conic to convex, then somewhat plane subumbonate, glabrous and even, but somewhat striate at the margin when moist, viscid, hygrophanous, dark brown or dirty olivaceous but with the umbo brownish ferruginous, fading to ochraceous or straw color.

Lamellae adnate, grayish or brownish yellowish to violaceous dark brown with whitish edges.

Stipe 42-52 × 1.5-2.5 mm, more or less equal or somewhat attenuate toward the base, hollow, flexuous, fibrillose, whitish or pale yellowish to reddish brown.

Veil rudimentary, as arachnoid white fibrils, no forming any annulus.

Context inodorous, taste mild.

Spores (7.7-) 8.8-9.9 (-11.2) × 6.6-7.1 × (4.9-) 5.5-6 µm, subrhomboid in face view, subellipsoid in side view, thick walled, dark yellowish brown, with a broad germ pore.

Basidia 19-23 × 6.5-9.5 µm, 4-spored, rarely 2-spored, hyaline, ventricose.

Pleurocystidia no observed.

Cheilocystidia 9-15 × 4.4-5.5 µm, abundant, forming a sterile band, hyaline, lageniform, thin walled, with a flexuous more or less elongated neck 1-1.5 µm broad.

Subhymenium yellowish formed by elongated to subglobose elements. Trama parallel, hyaline to brownish, hyphae up to 29 µm diam. Epicutis strongly gelatinized, hyaline of thin parallel filamentous hyphae. Hypodermium brownish, somewhat incrustated pigment on the walls of the elongated to globose, moderate thick walled hyphae. Clamp connections present.

HABITAT AND DISTRIBUTION. Scattered on more or less argillaceous soil, in shaped places, at 450 m elevation. Known only from the type locality. Fruiting in May.

STUDIED MATERIAL. CHILE, Prov. Valdivia, Cordillera Pelada, Western zone, *Singer M-5572* (Type BAFC).

DISCUSSION. *P. marthae* is close to *P. semistriata* (Peck) Guzmán, but that species has larger cheilocystidia, (16-) 26-36 µm long and is only known from the U.S.A. and Europe. Singer (1969) stated that the type is in SGO but the author did not find any in that Herbarium, but he did find three specimens well preserved in BAFC marked as "typus". This collection at BAFC is considered as the Holotype. On the other hand Singer (op cit.) described pleurocystidia and cheilocystidia as: "Cheilocystidiis et cystidiis aequalibus, ventricosis, in appendiculum effilatum ampullaceo protractis, hyalinis vel subhyalinis tenui-tunicatis", wrote Singer. He did not give any measure of them. If *P. marthae* has pleurocystidia and thick walled spores, then it belongs to Section *Atrobrunnea*. Singer (1975) considered *P. marthae* in the Section *Septembres* (see discussion of *P. septembris* in doubtful species).

The name of this species is in honor of Mrs. Martha Singer, wife of Dr. R. Singer.

48. *Psilocybe montana* (Pers. ex Fr.) Kumm. *Führ. Pilzk.*, p. 71, 1871.

Figs. 274-298, 674-675, 771, 774 & Map 3 (Plate 6)

Agaricus montanus Pers., *Obs. Myc.*, p. 9, 1796.

Agaricus atrorufus Schaeff., *Fung. Icon.* 3. T. 234, 1770.

Agaricus (Psilocybe) montanus Pers. ex Fr., *Syst. Myc.*, p. 293, 1821.

Agaricus (Psilocybe) atrorufus Schaeff. ex Fr., *Epicr.*, p. 230, 1838.

Psilocybe atrorufa (Schaeff. ex Fr.) Quél., *Champ. Jura et Vosq.*, p. 148, 1872.

Deconica atrorufa (Schaeff. ex Fr.) Karst.

Agaricus polytrichophilus Peck, *Ann. Rep. N. Y. St. Mus.* 30: 42, 1878.

Psathyra polytrichophila (Peck) Sacc., *Syll. Fung.* 5: 1068, 1887.

Deconica polytrichophila (Peck) Murr., *Mycologia* 14: 261, 1922.

Deconica bryophila Peck, *Ann. Rep. N. Y. St. Mus.* 46: 106, 1893.

Atylospora lateritia Murr., *Mycologia* 10: 20, 1918.

Psathyra lateritia (Murr.) Murr., *Mycologia* 10: 33, 1918.

Psilocybe lateritia (Murr.) Smith, *Mycologia* 40: 658, 1948.

Pileus (4-) 8-12 (-20) mm in diam., semiglobose to convex, or sometimes slightly subumbonate or subcampanulate to more or less plane in old specimens, glabrous, margin with or without veil remnants, as floccose fibrils, even, with transparently striate at the margin when humid, viscid, with a separable pellicle when moist and young, hygrophanous, dark brown or dark reddish brown to ochraceous, yellowish brown or beige when faded.

Lamellae broadly adnate, sometimes short subdecurrent, first pale grey brown to dark violaceous brown, with paler or whitish edges.

Stipe 16-25 (-50) × (0.5-) 1-1.5 (-2) mm, uniform in diameter, hollow, somewhat fibrillose, glabrous, but at first with very minute white appressed fibrillose patches from the veil, subflexuous, whitish or pale reddish brown to concolorous with the pileus or reddish brown toward the base, apex paler.

Veil whitish to pale brownish from the spores, floccose fibrillose, rudimentary, remains at margin of the pileus and at the apex of the stipe, but not forming an annulus.

Context thin, whitish and somewhat pliant at the pileus, brownish at the stipe, without any odor and flavor, or slightly fungal. KOH stains pileus brownish black.

Spore print dark gray brown.

Spores (6.5-) 7-8.5 (-9.9) × 4.5-5.5 × 3.3-5 μm, subrhomboid in face view, subellipsoid in side view, with thick (1 μm) dark brownish wall, and with broad plane germ pore, up to 1 mm wide.

Basidia 16-22 × 5.4-7.7 μm, 4-spored, sometimes 2-spored, hyaline or rarely subhyaline, cylindric-subpyriform or ventricose.

Pleurocystidia absent.

Cheilocystidia (15-) 22-45 × 4.4-7.5 (-10) μm, forming a sterile band, hyaline, lageniform or ventricose with acute apices, neck elongated, 2-3.5 μm diam., sometimes divided; frequently with drops of a highly viscous substance at the apex.

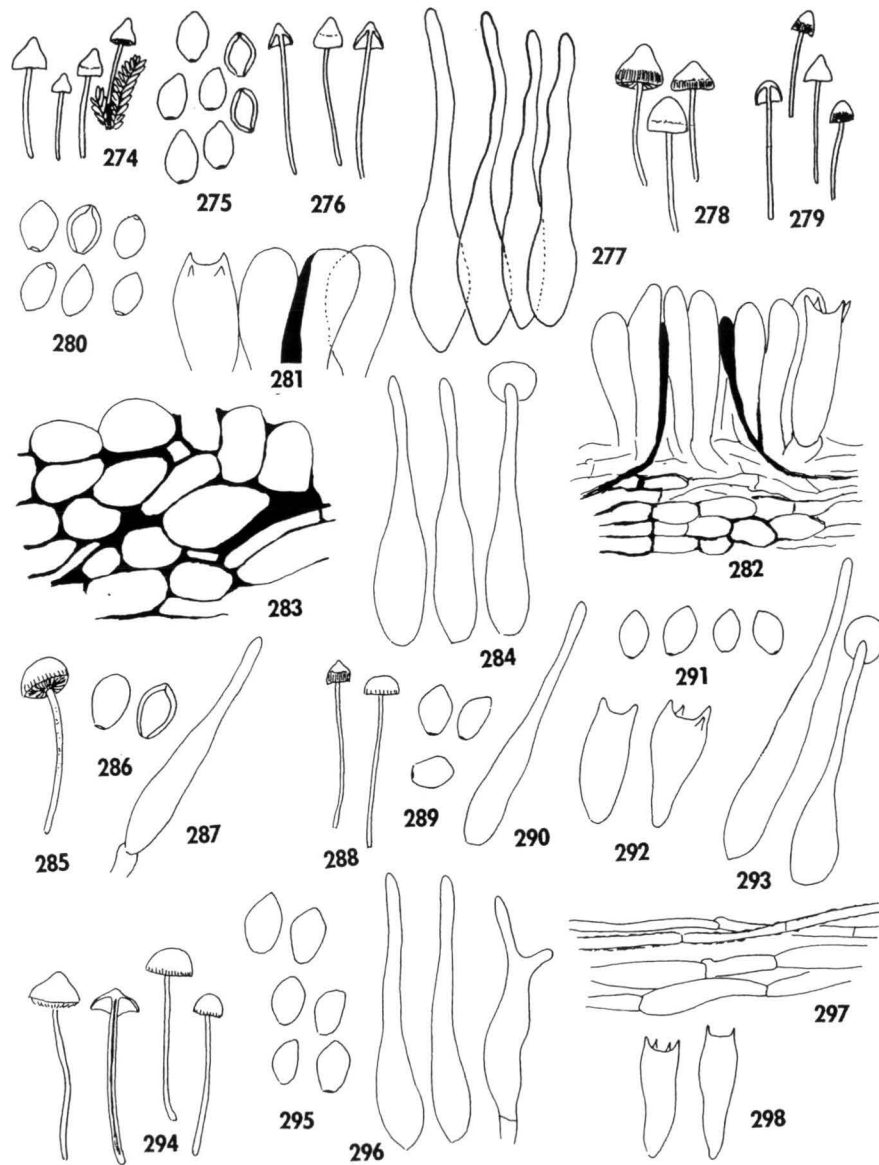


Plate 24: Figs. 274-298: *Psilocybe montana*, 274: Carpophores, 275: Spores, 276: Carpophores, 277: Cheilocystidia, 278-279: Carpophores, 280: Spores, 281-282: Hymenium, 283: Trama, 284: Cheilocystidia, 285: Carpophore, 286: Spores, 287: Cheilocystidia, 288: Carpophore, 289: Spores, 290: Cheilocystidia, 291: Spores, 292: Basidia, 293: Cheilocystidia, 294: Carpophores, 295: Spores, 296: Cheilocystidia, 297: Pileus, 298: Basidia (274-275 & 277: Guzmán 16244; 276: Guzmán 16236; 278: Guzmán 9238; 279: Guzmán 9220; 280-281 & 283-284: Lundell 1145; 282: Karsten 1526; 285-287: type of *P. lateritia*; 288-290: type of *Deconica bryophila*; 291-293: type of *P. polytrichophila*, 294-296: Horak 65-38; 297-298: Horak 61-510).

Subhymenium subcellular, hyaline, but with orange brown or yellowish brown pigment strongly and irregularly incrusting on the walls; sometimes the irregular pigmented hyphae ascending to the hymenium resembling with chrysocystidia. Trama formed of parallel hyphae with brown pigment incrusting on the walls. Epicutis formed by a gelatinized layer of hyaline to pale yellowish or brownish pigmented hyphae, incrusting on the walls. Hypodermium with globose cells like those of the subhymenium, 7-15 μ m wide, irregularly incrusting with brown pigment. Clamp connections present.

HABITAT AND DISTRIBUTION. Gregarious, rarely solitary on soil or sandy soil, always covered by mosses or dense bryophyte mats (specially *Polytrichum*, not *Sphagnum*), in open forests, road sides, tracks, banks of rivulets, fire places, of coniferous or deciduous trees of along the margin of pasture-lands. Høiland (1978) reported *P. montana* from Norway in the following bryophytes: *Cephalozia* sp., *Nardia scalans*, *Ceratodon purpureum*, *Dicranella subulata*, *Drepanocladus uncinatus*, *Kiceria starkei*, *Oligotrichum hercynicum*, *Pogonatum urnigerum*, *Pohlia* spp., *Polytrichum juniperium*, *P. piliferum*, *P. spp.*, *Racomitrium canescens*, *R. fasciculare* and *R. lanuginosum*. He wrote "It may be dependent on the dead parts of the bryophyte shoots. This is our most common *Psilocybe* species, and it occurs from the lowlands to the high up in the mountains". Known (or at least recorded) from Europe, North, Central and South America, northern Africa and Australia. Fruiting in June-October in temperate places, or in winter time in subtropical regions. According to Høiland (1978) fruiting probably the whole year under favorable conditions. See more ecological information in Lange & Skifte (1967).

STUDIED MATERIAL. ALASKA, Amchitka Island, *Amundsen & Clebsch* 4867 (TENN 36496). Anchorage, *Weels & Kempton* 6360 (ENCB).

GREENLAND, Ivigtut, *Lange* 71 (C); Hassell, Fjeld, *Lange* 210 & 364 (both C as *P. physaloides*).

U.S.A., Arizona, De Meltte Pk., *Thiers* 28017 (SFSU). Idaho, Bringe Mt., *Smith* 65228 (MICH). Great Lake, *Smith* 71248 (MICH). Kamikn, Priest Lake, *Smith* 67861 & 71251 (MICH). Lick Creek Summit, near Payette Lakes, *Smith* 58367 (MICH). Bouldos Lake, McCall, *Smith* 64892 & 68846 (MICH). Grant Mt., *Smith* 65147 (MICH). Michigan, Pinckndy, *Smith* 72909 (MICH). Berry Creek, *Smith* 74404 & 74406 (MICH). Cut River Hardwoods, at Cut River Bridge, Upper Peninsula, *Smith* 36428 (MICH). Oakland, near Pontiac, *Smith* 6358 (MICH). Bay View, *Kauffman* s.n. (Jul. 13, 1905) (MICH). Washtenaw, Waterloo, *Smith* 67834 & 67835 (MICH). Ann Arbor, *Smith* 6119; 6126 & 33961 (MICH), *Kauffman* s.n. (May 18, 1905 & Oct. 18, 1936) (MICH). Pellston, Univ. Mich. Biol. Station, *Smith* 1184; 1187 & 63311 (MICH). New Hampshire, Mt. Washington, White Mts., *Singer* W-33 (FH). New York, Albany, *Peck* s.n. (NYS Type of *Deconica bryophila*). West Albany, *Peck*, s.n. (NYS Type of *Agaricus polytrichophilus*). Tompleing, *Rogerson* 2028 (NY as *P. subviscida*). Oregon, San Lake, *Smith* 79900 (MICH). Lane, *Leslie* 3989 (ENCB), *Smith* 67385 (MICH). Tennessee, Great Smoky Mts., near Mt. Le Conde, *Hesler* 14193 (TENN). Washington, Olympics Lake Angeles, *Smith* 14627 (MICH). Wenatchee State Park, *Stuntz* 6234 & 6235 (WTU). Anderson Lookout, near Baker Lake, *Smith* 16949 (MICH).

MEXICO, State of Chiapas, San Cristobal de las Casas to Tzontehuiz, *Welden* 4521 (ENCB). State of Coahuila, Municipio de Arteaga, La Siberia, *Guzmán* 10747 (ENCB). Distrito Federal, La Venta, near Desierto de los Leones, *Guzmán* 11992 (ENCB). State of Oaxaca, road Tuxtepec to Oaxaca, near Vista Hermosa, *Guzmán* 17664 (ENCB); near La Esperanza, *Guzmán* 16217 (ENCB); near Llano de las Flores, *Guzmán* 16220 (ENCB); desv. to Santiago Comaltepec, *Guzmán* 16236 & 16244 (ENCB). State of Puebla, Paso de Cortés (Sierra Nevada), *Pollock* s.n. (Sept. 18, 1976) (ENCB); *Guzmán* 1207 & 1665 (ENCB). State of Mexico, National Park Lagunas de Zempoala, road to Chalma, *Guzmán* 17830 (ENCB). Northern Iztaccihuatl, Zoquiapan, *Guzmán* 19162 (ENCB). Nevado de Toluca region, near Raíces, *Guzmán* 16519 & 16532 (ENCB); near El Mapa, *Léon* 3 (ENCB); *Guzmán* 8314 (ENCB); road to El crater, *Guzmán* 5369 (ENCB). State of Morelos, near Huitzilac, road to Lagunas de Zempoala, *Guzmán* 3165 (ENCB). State of Veracruz, Eastern La Joya, road to El Rodeo, *Guzmán* 17800 (ENCB).

ARGENTINA, Neuquén, Puerto Manzano, *Singer* 3283 (BAFC as *P. ecbola*).

CHILE, Valdivia, Cuesta Santa Elvira, *Singer* M-7347 (SGO).

COLOMBIA, Cundinamarca Dept., Páramo de Palacio, Hacienda La Siberia, *Guzmán* 9128 (COL; ENCB); *Betancourt* 165-A (COL; ENCB). Road to Pacho, near Upapira, *Guzmán* 4550 (COL; ENCB).

JAMAICA, Cinchona, *Murrill* 471 (NY Type of *Psathyra lateritia*).

VENEZUELA, Parque Nacional Sierra Nevada, Teleférico Mérida to La Aguada, *Guzmán* 9240 & 9286 (ENCB). Sierra Nevada de Santo Domingo, Mucubaji Valley, *Dennis & Buza* 1727 (K, no vidi); *Guzmán* 9235 & 9238 (ENCB).

AUSTRIA, Wiener Wald, Martio, *Höhnle* 2019 (B, H, LD, as *P. physaloides*). Kritzensdorf, Langstögerberg, *Höhnle* s.n. (BP 18547).

BELGIUM, Bruzelles, *Heinemann* 2839 (BR; BPI). La Calamire, Liege, *Heinemann* 3053 (LFG). Kasterlev, Antwerpen, *Darimont* s.n. (Oct. 7, 1943) (LG).

CZECHOSLOVAKIA, Klikov, Suchdol, *Svreckek & Kubicka* s.n. (PR 611409). Montes Tatrae Magnae, Prope Tatranska, *Kuthan* s.n. (17-IX-70 & 14-IX-70) (BRA). Without locality, *Kubicka* s.n. (*Herink* Herb. 446-43, PR-703992 as *P. muscicola* Herink, nom. nud.).

DENMARK, Boto, Jylly, Borris Hede, *Ferdinandsen & Winge* s.n. (Aug. 1908) (C). *Moller* s.n. (10-11-1940 & 23-4-1937) (C, the latter as *P. bullacea*).

GREAT BRITAIN, Great Brickhill, near Bletchley, *Reid* s.n. (Jul. 25, 1957) (K & ENCB).

FINLAND, Vesteroundon, *Thomikoski* s.n. (Oct. 19, 1953) (H). Paraenen, Attu, *Schulmann* 172 (H). Tammisaari, *Schulmann* s.n. (Jul. 16, 1962) (H). Matomiemi, Porraskoski, Lammi, *Schulmann* s.n. (Jul. 2, 1952) (H). Satakunta, Tyrva, *Karsten* 1525 (H). Tavastia, Tammela, Kyto, *Karsten* 1527 & 1528 (H). Merimasku, *Karsten* 1526 (H). Virolahti, Eerikkala, *Harmaja & Rintapen* s.n. (Nov. 7, 1967) (H).

FRANCE, Savoie, Val d'Isère, *Heinemann* 2773 (BR). Hautes Alpes, Ristulas, *Heinemann* 5048 (BR). Mardelot, *Bon* 72121308 (Herb. Bon & ENCB).

GERMANY, *Sydow* s.n. (Sept. 1885) (W); *Sydow* 1816 (B, W. MICH, PR, as *P. physaloides*).

HUNGARY, Mts. Budai, Paty, *Ferenaz & Véssey* s.n. (BP 48445).

SWEDEN, Upland, *Morander* s.n. (May 9, 1948) (UPS). Bondkyrka, *Nannfeldt* s.n. (Oct. 14, 1945) (UPS). Smaland, Femsjö, *Lundell & Haglund* 5756 & 5782 (UPS); *Lundell* 1145 (UPS, PR, BPI). Almesakra, *Haglund* 620; 746; 817 & 872 (UPS). Bondkyrka, *Lundell* s.n. (Oct. 6, 1935) (UPS). Jamtland, Snasabogarna, *Nannfeldt* 11581 (UPS). Vastergikabdm, Askims, *Nathorst-Windahl* 2360 & 2117 (GB); 5997 (GB as *P. muscorum*).

SWITZERLAND, Near Teufen, *Guzmán* 9575, 9577, 9578 (ENCB). Southern Davos, Bernina to Grüm, *Guzmán* 9533 (ENCB). Without locality, *Bon* (Herb. Bon & ENCB).

U.S.S.R., Kola, Lapponia, *Tulomensis*, *Karsten* 1529 (H).

DISCUSSION. This species is close to *P. semistriata* (Peck) Guzmán but differs in the broader spores of that species. It is also close to *P. angulata* (Pers.) Sing. but the viscid pileus in *P. montana* seems to distinguish both. Karsten (1876) seems to be the first to consider *P. montana* and *P. atrorufa* to be synonymous. There is no doubt *Agaricus atrorufus* Schaeff. is the same as *A. montanus* Pers. Referring to the modern synonym of *P. montana*, the study of the types of Peck's and Murrill's materials (*Agaricus polytrichophilus* Peck, *Deconica bryophila* Peck, and *Athylospora lateritia* Murr.) show that there are not any differences between these species and *P. montana*. Smith (1948) after the study of the type of *Athylospora lateritia* Murr., concluded that it is a good species of *Psilocybe*, but belongs in the group with *P. montana*, "but since this group is in need of a critical study, no attempt at further comparisons will be made there. It is not identical with any of my collections in that group", wrote Smith (*op. cit.*). Singer (1948) supposed that *A. polytrichophilus* Peck is a synonym of *P. montana*. Smith (1948) based on the "odorous" context reported by Peck in *A. polytrichophilus*, did not consider it a synonym of *P. montana*.

P. montana was considered a complex group (Lange, 1955; Lange & Skifte, 1967; Orton, 1960). "*P. montana* is made up of several distinct taxonomic units" wrote Lange (*op. cit.*) and Lange & Skifte (*op. cit.*), but the fact is that this species shows great variation (see for instance the range in the size of the spores, cheilocystidia and pileus), and it is very close to several species such, as *P. semistriata* (Peck) Guzmán, *P. angulata* (Pers.) Sing., *P. andina* Guzmán, *P. acadiensis* Smith, *P. crobula* (Fr.) M. Lange ex Sing., *P. inquilina* (Fr. ex Fr.) Bres., *P. graminicola* (Orton) Orton, *P. apiculosa* Orton, *P. latisporea* Murr., *P. phyllogena* (Peck) Peck, etc. The two varieties considered by Killermann (1936), *P. atrorufa* f. *brevipes* Kill. and *P. atrorufa* f. *longipes* Kill. very probably are synonyms of the type variety.

Several reports of *P. montana* (or *P. atrorufa*) have been made from Europe (besides Schaeffer's, Persoon's, Fries', Kummer's, Quélet's, and Karsten's mentioned as synonyms), such as: Berkeley & Broome (1837-1885), Smith (1908), Ricken (1915, 1920), Möller (1945), Lange (1939), M. Lange (1948), Bon (1970), Heim (1957d), Favre (1955; 1960), Dennis *et al.* (1974), Bresadola (1931), Macdonald (1959), Straus (1959), Romagnesi (1936, 1937), Schulmann (1960), Pegler (1966b), Watling & Richardson (1971), Velenovsky (1920), Moser (1967), Orton (1969), Horak (1963), Kreisel (1970), Eliade (1965), Urbonas *et al.* (1974), Bresinsky & Haas (1976), and Jarva & Parmato (1980).

P. montana had been recorded from North America by Kauffman (1918), Miller (1972) and Lange (1955), besides the reports by Peck (1912), and Murrill (1918). From Mexico and South America, there are reports by Guzmán *et al.* (1977), Guzmán (1978a), Dennis (1970) and Singer (1969). This species had been noted from North Africa by Malençon & Bertault (1970), from Tanzania and Tanga (East Africa) based on Hennings's and Eigelbaum's reports by Pegler (1977). *P. montana* had been collected from Australia by Cooke (1892) and commented upon by Guzmán & Watling (1978). The photomicrograph of the spores of *P. montana* shown by Singer (1949, 1962 & 1975) seems belong to *P. semistriata* (Peck) Guzmán for their broad diameters (see discussion of that species). The drawing spore of *P. atrorufa* made by Melendez-Howell (1967) is only a side view. One collection from Denmark, *Christiansen* 6110 at C, identified as *P. atrorufa* is a *Psathyrella* sp. *P. pteridophytorum* Sing. and *P. omnium-sanctorum* Sing. are probably synonym with *P. montana*; the cheilocystidia, spores size and shape are practically the same in these three species. It seems that the habitat is the only difference between them, but as the studied material of Singer's species is very scanty and/or in poor condition (not well preserved), it is preferable to consider these fungi, for the moment, as independent species. Høiland's specimens from Norway showed no content of psilocybin in the chemical analyses, according to Høiland (1978).

The name of the species refers to the temperate or cold forests where this fungus is common.

SELECTED ILLUSTRATIONS. Horak (1968, p. 212); Lange & Hora (1963, p. 149); Imler (1936, pl. LXXIII); Schaeffer (1800, vol. 4, p. 58, pl. CCXXXIV) (no pl. CCXXXIV); Stamets (1978, fig. 20).

49. *Psilocybe nothofagensis* Guzmán & Horak *Sydowia* 31: 47, 1978. Figs. 265-269

Pileus 3-6 mm in diam., conical, also in aged carpophores, glabrous, even, striate towards the margin, hygrophanous, dark brown to fuscous.

Lamellae broadly adnate to subdecurrent, deep brown, ventricose, white and fimbriate.

Stipe 15-20 × 0.5-1 mm, cylindrical, equal, cartilaginous, concolorous with pileus, apex pruinose, otherwise glabrous.

Veil remnants absent in the adults, veil seems cortinate and fugacious.

Context very thin and somewhat pliant, with odor and taste not distinctive.

Spore print brown.

Spores (5-) 5.6-6 (-6.5) $\times$ 3.5-4.5 (-5) $\times$ 3.3-3.8 μ m, subrhomboid in face view, ellipsoid in side view, yellowish brown, thin-walled, with broad germ pore.

Basidia 15-25 $\times$ 5-7 μ m, 4-spored, hyaline, subventricose.

Pleurocystidia absent.

Cheilocystidia 16.5-28 $\times$ 4.5-7 μ m, forming a sterile gill edge, hyaline, ventricose-rostrate or sublageniform, necks 2.2-2.7 μ m diam.

Subhymenium composed of hyaline hyphae irregularly encrusted, with yellowish pigment on the walls or among the hyphae. Trama regular, hyaline to brownish, with incrustated pigment on the walls. Epicutis composed of gelatinized hyphae, irregularly encrusted with yellowish pigment. Clamp connections numerous.

HABITAT AND DISTRIBUTION. Single or caespitose on rotten, mossy wood in *Nothofagus* forests. Known only from Papua, New Guinea.

STUDIED MATERIAL. PAPUA, NEW GUINEA, Morobe District, Wau, Mt. Kaindi; Horak s.n. (Type ZT 72/605).

DISCUSSION. This species is close to *P. montana* (Pers. ex Fr.) Kumm., but the size of the spores separate them. Furthermore, *P. montana* grows on soil, never on rotten wood.

The name of the species refers to the *Nothofagus* forests where this species grows.

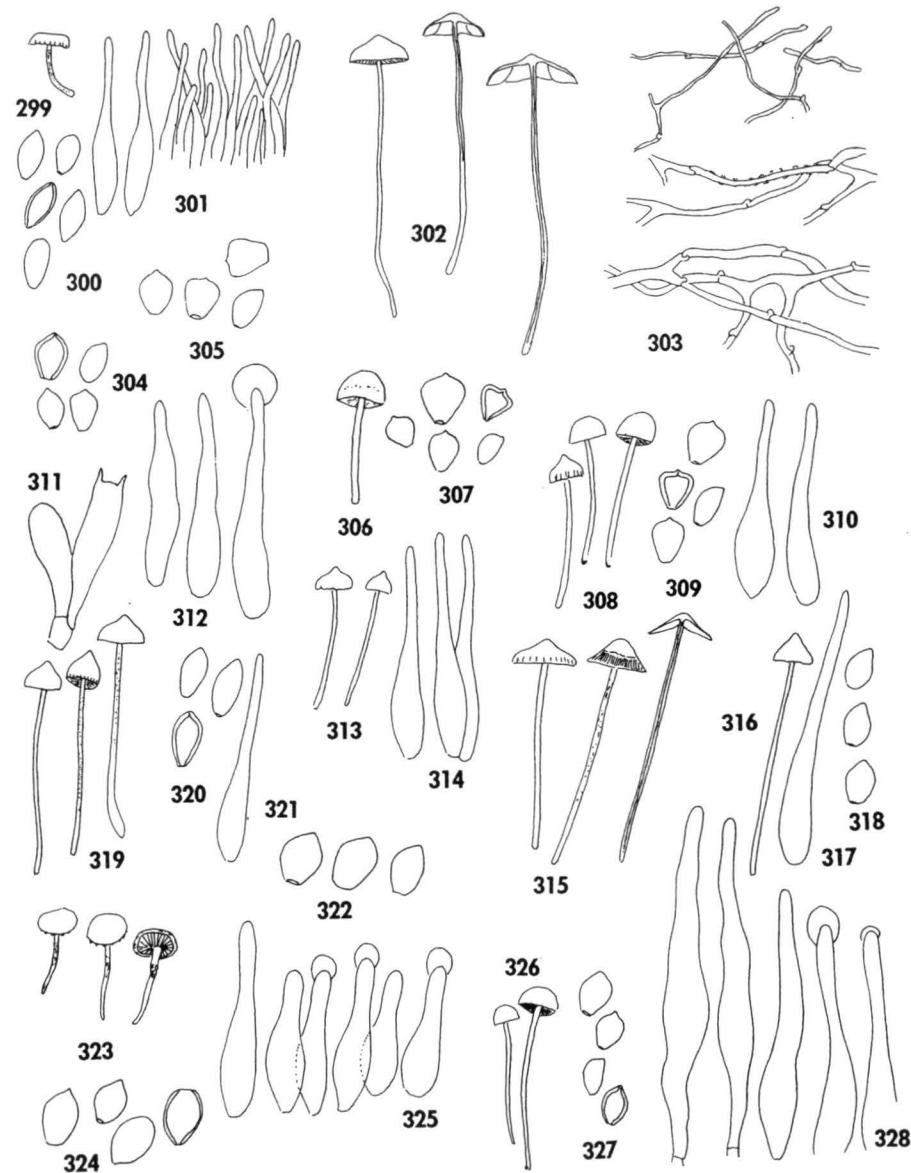


Plate 25: Figs. 299-328. - Several species of *Psilocybe*. 299-301: *P. ommium-sactorum*, 299: Carpophore, 300: Spores, 301: Cheilocystidia (all from the type). 302-319: *P. phyllogena*, - 302: Carpophores, 303: Pileus, 304-305: Spores, 306: Carpophores, 307: Spores, 308: Carpophores, 309: Spores, 310: Cheilocystidia, 311: Basidia, 312: Cheilocystidia, 313: - Carpophores, 314: Cheilocystidia, 315-316: Carpophores, - 317: Cheilocystidia, 318: Spores, 319: Carpophores (302-303: Horak 76-121; 304, 311-312 & 319: type of *Psathyra conica*; 305: Singer; 306-307: Höhnelt; 308-310: type; 313-314: type of *P. modestus*, 315: Guzmán 9614; 316-318: type of *P. sphagnicola*). 320-321: *P. pteridophytorum*, 320: Spores, 321: Cheilocystidia (all from the type). 322-325: *P. physaloides*, 322: Spores, 323: Carpophores, 324: Spores, 325: Cheilocystidia (323 & 324: Lundell 1149; 322 & 325: Reid). 326-328: *P. rhomboidospora*, 326: Carpophores, 327: Spores, 328: Cheilocystidia (all from the type).

50. *Psilocybe omnium-sanctorum* Sing. *Nova Hedwigia* 29: 251, 1969. Figs. 299-301

Pileus 6-17 mm in diam., semiglobate or pulvinate-convex when young, then convex and eventually somewhat flattened or even depressed in the center, and later subumbonate or umbonate to papillate, glabrous, even but transparently striate on the margin when moist, viscid, hygrophanous, chestnut color very deep or reddish brown, fading to pale brownish.

Lamellae broadly adnate, often with a slightly decurrent tooth, brown, then fuliginous-brown, fuscous, or sepia, edges concolorous.

Stipe 10-33 × 1-3 mm, equal or slightly tapering upwards, light brown above, very deep fuscous-castaneous below, eventually entirely deep reddish brown or fuscous, with a glabrous apex but floccose-fibrillose below.

Veil whitish, cortinate, disappearing very soon, or remains around the pileus margin or at the apex of the stipe in young stages.

Context thin and somewhat pliant, concolorous with the surface of the pileus, unchanging, inodorous, and taste mild.

Spores (6-) 6.5-8 (-8.5) × (3.8-) 4.5-5.5 μm, subellipsoid or subrhomboid in face view, ellipsoid in side view, yellowish brown thick walled, and with a broad truncate apex with the germ pore.

Basidia 13-20 × 6-7 μm, 4-spored, hyaline, ventricose or subpyriform.

Pleurocystidia absent.

Cheilocystidia 16-44 × 3.5-9.7 μm, very abundant, hyaline, but sometimes with the base brownish, sublageniform or lageniform, with a long and flexuous neck, 1-3 μm diam. and subcapitate apex 2-4 μm wide.

Subhymenium subcellular, subhyaline to brownish with incrusting pigment. Trama regular, with hyphae hyaline to somewhat incrusting by yellowish brown pigment on the walls, 2 μm thick. Epicutis formed by a more or less thin hyaline, subgelatinized layer, with elongated hyphae. Hypodermium subcellular, incrusting like the subhymenium. Clamp connections present.

HABITAT AND DISTRIBUTION. Gregarious on rotten wood, or buried chips and on standing trees, in *Eucryphia* or mixed woods. Known only from Chile and Argentina. Fruiting in March and May in Chile, and in March, April and November in Argentina.

STUDIED MATERIAL. CHILE, Llanquihue, Peulla, Lago Todos los Santos, *Singer M-1922* (Type BAFC). Valdivia, Cordillera Pelada, *Singer M-5465a* (BAFC).

ARGENTINA, Rio Negro, Camino de la Laguna Frías, *Singer M-4032* (BAFC). Neuquén, Lago Correntoso, *Singer M-5088* (BAFC).

DISCUSSION. This species is very close to *P. montana* (Pers. ex Fr.) Kumm. Singer (1969) reported the cheilocystidia "accompanied by mostly brownish broadly ventricose or ventricose-vesiculose bodies, at least in some specimens", a feature

not observed by the author. The only observed in some specimens cheilocystidia with a brownish base, that connects this species with those of Section *Brunneo-cystidiata*. More studied on this species are necessary to better define its taxonomic position. Singer (1969) appointed the type in LIL but the author found it in BAFC. Singer (*op. cit.*) related his species to *P. crobula*-group.

The name of the species refers to the type locality's name, in Spanish: "Todos los santos", which means all the saints.

51. *Psilocybe phylogena* (Peck) Peck *Bull. N. Y. State Mus.* 157: 99, 1912.

Figs. 302-319 & 773

Agaricus (Hypholoma) phylogenus Peck, *Ann. Rep. N. Y. State Mus.* 26: 60, 1874.

A. (Hypholoma) modestus Peck, *Ibid* 32: 29, 1879.

Hypholoma phylogena (Peck) Sacc., *Syll. Fung.* 5: 1042, 1887.

H. modesta (Peck) Sacc., *Syll. Fung.* 9: 139, 1891.

Agaricus rhombisporus Britz., *Rev. Hym.* 3: p. 16, 1899.

Psilocybe rhombispora (Britz.) Sacc., *Syll. Fung.* 11: 72, 1895.

Psathyra conica Peck, *Ann. Rep. N. Y. State Mus.* 54: 153, 1901.

Stropharia rhombispora Höhnelt, *Ann. Myc.* 1: 393, 1903.

Psilocybe phylogena f. *modesta* Peck, *Bull. N. Y. State Mus.* 157: 99, 1912.

P. sphagnicola Smith, *Jour. Elisha Mitch. Sc. Soc.* 62: 197, 1946.

P. modestus (Peck) Smith, *Mycologia* 40: 700, 1948.

Deconica rhombispora (Britz.) Sing., *Lilloa* 22: 509, 1949.

Geophila rhombispora (Britz.) Kühn. & Romag., *Fl. anal. champ. sup.*, p. 338, 1953.

Pileus (4-) 10-15 (-22) mm diam., conic to convex, or conic-campanulate, or subumbonate, then expanding to slightly umbonate, glabrous, except for white patches or flocculent fibrils of the evanescent veil remnants adhering at first along the margin in young specimens, surface even but margin slightly striate when moist, viscid or subviscid when moist, hygrophanous, dark reddish brown or brown-reddish, fading to pale ochraceous, pale chestnut-color, ochraceous buff, or brownish yellowish when dry.

Lamellae broadly adnate to somewhat subdecurrent, pale grayish brown, becoming dark purple-brown, chocolate-brown, or violaceous brown, with white or whitish and slightly crenulate edges.

Stipe (20-) 30-60 (-90) × 1-1.5 (-2.5) mm, flexuous, equal or slightly subbulbous, stuffed or hollow, silky fibrillose, brown or brownish to straw-color, covered by dense whitish fibrils from the veil, sometimes expanding at the base into a thin flat disc which adheres closely to the substratum.

Veil poorly developed, as whitish flocculent fibrils in the young specimens, which soon disappear in the adult stages.

Context moderately thick (1-3 mm thick) at the pileus (in specimens 10-15 mm diam.), pliant and brownish or reddish brown, both in pileus and stipe. Taste mild. KOH stains both pileus and stipe brown dark.

Spore print dark chocolate brown.

Spores (5.5-) 6-7 (-10) $\times$ (4.5-) 5-5.5 (-7) $\times$ (3.8-) 4.4-5 μm , rhomboid or subrhomboid in face view, subellipsoid in side view, dark yellowish brown, thick walled (more or less 1 μm thick), and with a broad germ pore. In some specimens abnormal spores can be observed with two pores or with a distinct heart shape.

Basidia (14-) 19-28 $\times$ 5-6.6 μm , 4-spored, rarely 2-spored with sterigmata up to 2 μm long, hyaline, ventricose-subcylindric, or ventricose-subpyriform, often with a median constriction, sometimes with a clamp connection at the base.

Pleurocystidia absent.

Cheilocystidia 22-35 (-37) $\times$ (3-) 4.4-6 (-7) μm , abundant, forming a sterile band, hyaline, narrowly ventricose-fusoid, sublageniform, lageniform or subfiliform, with a flexuous neck 2.2-3.5 μm diam., often with an adhering viscous hyaline globule at the apex.

Subhymenium subcellular, hyaline to pale yellowish brown, with incrusting pigment irregularly on the walls. Trama regular, somewhat interwoven, hyaline or pallid to pale brownish. Epicutis forming a thin pellicle of gelatinous flexuous, hyaline, narrow (2-4 μm diam.) hyphae. Hypodermium yellowish brown to gradually hyaline, with elongated hyphae or subglobose cells, 4-12 μm diam., with pigment moderately incrusting the walls. Clamp connections are very common.

HABITAT AND DISTRIBUTION. Single, scattered or gregarious, sometimes caespitose, on leaves, mainly of deciduous trees (such as *Fagus*), rarely on *Sphagnum* (this later the type of *P. sphagnicola*), or other mosses, or on rotten wood, logs, or twigs, rarely on soil, in deciduous (rarely coniferous) forests, frequently in open forests with grasses. Høiland (1978) referring to the habitat of *P. rhombispora* (a synonym) appointed: "The species does not grow only on debris of vascular plants, but is also found on bryophytes". This species fruiting in summer time.

STUDIED MATERIAL. CANADA, New Brunswick, Kouchibouguac Nat. Park, Redhead 2801 (DAOM 169851; ENCB).

U.S.A., Idaho, Boundary, Priest Lake, *Smith 67850* (MICH). Michigan, Emmeth, *Smith 74408* (MICH). Pellston, near Univ. Mich. Biol. Station, *Smith 32274* (MICH). Tahquamenon Falls, *Smith 37761* (MICH). Colonial Point, Cheboygan, *Smith 1280* (MICH Type of *P. sphagnicola*); *Smith 25439 & 63516* (MICH). Mackinac, *Smith 75387* (MICH). New York, Adirondack Mount, *Peck s.n.* (NYS Type of *Agaricus (Hypholoma) modestus*). Otsego, Worcester, *Peck s.n.* (NYS Type of *Agaricus (Hypholoma) phyllogenus*). Franklin, Floodwood, *Peck s.n.* (NYS Type of *Psathyra conica*). Tennessee, Ducktown, *Sharp s.n.* (TENN 8938). Washington, Lake Crescent, *Smith 14039* (MICH). Without locality, *Leslie 4680* (only microscopical notes and photo).

COLOMBIA, Dept. Boyaca, Mpio. Ouitama, Páramo de la Rusia, Vereda El Carmen, *Díaz s.n.* (30-XI-78) (COL).

AUSTRIA, *Singer s.n.* (Aug. 1929) (W). Niederosterr., *Höhnle B-1765-C* (part) (FH type of *Stropharia rhombispora*).

CZECHOSLOVAKIA, Karlstejn, *Vacek s.n.* (PR 703979 as *P. physaloides*).

FINLAND, Parikkala, Kasun, *Schulman 12 & 82* (H). Ekenas, Tamissarii, *Malmstroom s.n.* (Jul. 25, 1933) (H as *Psilocybe foeniculii*).

HUNGARY; Mt. Bükk, Mt. Balazs-hegy, *Bohus & Babos s.n.* (BP 30889). Mt. Samass-hegy, *Bohus & Babos s.n.* (BP 31035).

NORWAY, Mo. Rana, Ortfjell, *Horak s.n.* (ZT 26/121) (*no vidi*).

SWEDEN (?), Without any legible information, date: 1870 (UPS as *Stropharia rhombispora* Höhnle by Singer).

SWEDEN; Uppland, Alsike, *Holm & Belin s.n.* (Sept. 14, 1963) (UPS).

SWITZERLAND, Grampian, near Susch, *Guzmán 9614* (ENCB).

U.S.S.R., Caucasus region, *Singer* (Aug. 1929) (W).

DISCUSSION. This species has a great variation in morphology, and a widespread distribution in North America and Europe. It seems very common in the Eastern United States, rare in the Northwest, and common in Europe. Kühner & Romagnesi (1953), Schulmann (1960), Domanski *et al.* (1963), Orton (1969), Moser (1967), Urbonas *et al.* (1974), Bresinsky & Haas (1976) and Høiland (1978) reported this species (as *P. rhombispora*) from several countries of Europe. Dennis (1970) doubtfully reported *P. modestus* (a synonym of *P. phyllogena*) from Venezuela. Konrad & Maublanc (1924-1937) considered *A. rhombisporus* Britz. (another synonym of *P. phyllogena*) as excluded species. The type of *P. phyllogena* (at NYS) agrees well in all the important taxonomic features with the types of *Agaricus modestus* Peck, *Psathyra conica* Peck (both at NYS) and *P. sphagnicola* Smith (in MICH), and with the considerable material in Europe known as *P. rhombispora* (Britz.) Sacc., based on Horak's notes, Singer's notes and on herbarium material from H, BP, UPS and W. *Stropharia rhombispora* Höhnle is considered here a synonym of *P. phyllogena* based in the study of the type at FH. Høiland (1978) considered *Naucoria tenax* (Fr.) Rick. sensu Rick as synonym of *P. rhombispora* (see *Geophila tenax* in Doubtful species).

P. phyllogena is closely related to *P. montana* (Pers. ex Fr.) Kumm. and *P. angulata* (Pers.) Sing., but differs in the size of the spores. *P. latispora* Murr. differs from *P. phyllogena* in the size of cheilocystidia, as does *P. mammillata* (Murr.) Smith which belongs to the Section *Cordisporae* because of its characteristic bluing reaction. For the Bigelow (1978) report of *P. rhombispora* (Britz.) Sacc. from Massachusetts (U.S.A.) see the discussion of *P. rhomboidospora* (Atk.) Smith ex Guzmán. The studied specimens from Colombia have cheilocystidia 22.1-31.8 $\times$ 3.9-10.4 μm , sublageniform to irregularly branched or somewhat moniliform; the spores are (5.8-) 6.5-7.8 $\times$ (3.9-) 4.5-6.5 μm ; this is probably an undescribed fungus.

The name of the species means that this fungus grows on leaves, one of its most common habitats.

SELECTED ILLUSTRATION. Peck (1901, pl. H, figs. 17-22, as *Psathyra conica*) (Not a very good figure of this species). Laplanche (1894) cited the figures: Britzelmayer (Melanospor. f. 221, 222, 223, 224).

52. **Psilocybe physaloides** (Bull. ex Mérat) Quél. *Champ. du Jura et Vosges*, p. 256, 1872. Figs. 254-255, 322-325, 666 & 691

Agaricus physaloides Bull., 1789.

A. physaloides Mérat

A. physaloides Fr., *Epicrisis*, p. 229, 1838.

P. caespitosa Murr., *Mycologia* 15: 5, 1923.

P. physaloides var. *substerilis* Lange, *Dan Bot. Ark.* 9: 26, 1936, nom. nud.

non *P. physaloides* (Bull. ex Mér.) Quél. sensu Bresadola, *Icon. Myc.* Vol. 18, pl. 866, fig. 1.

Pileus (5-) 10-15 (-25) mm in diam., convex to slightly subumbonate, becoming plane in old specimens, glabrous, even, somewhat striate at the margin when moist, viscid, hygrophanous, reddish brown to pinkish cinnamon or darker alutaceous, fading to whitish yellow or pale straw color.

Lamellae adnate or adnexed, with a slight decurrent tooth in age, dark vinaceous at first to violaceous brown or brownish gray, with concolorous and even edges or they are subfloccose and whitish.

Stipe (15-) 30-40 (-50) × 1-1.5 mm, equal, or frequently thicker at the apex, rigid, pliant, hollow, whitish to concolorous with the young gills at first and thinly coated with more or less with avellaneous fibrils, becoming dark blackish brown from the base upward in age; slightly strigose at the base.

Veil conspicuous as arachnoid fibrils in young stages that remains as a appendages on the margin of the pileus and as fibrils on the stipe.

Context moderately thick and pliant at the pileus, concolorous with the surface, somewhat fibrous and brownish in the stipe. Odor and taste mild.

Spore print violaceous blackish brown.

Spores (6-) 6.6-7.5 (-8) × 4.4-5 (-5.5) × 3.3-4.4 μm, subrhomboid in face view, subellipsoid in side view, pale yellowish brown, moderately thin walled, with a more or less broad germ pore. Some spores are abnormal with two germ pores.

Basidia 16-22 × 6.6-8.8 μm, 4-spored, subcylindric or ventricose-subpiriforme, hyaline.

Pleurocystidia absent.

Cheilocystidia 16-28 (-33) × 4-7 μm, sublageniform or fusoid, or subfusiform to subfiliform or ventricose-fusiforme, with short necks 3.3-4.4 μm diam., hyaline, more or less abundant.

Subhymenium subcellular with hyaline or pale brownish elements, 3-6 μm diam. Trama parallel, pale to dark cinnamon-brown, with hyphae 7-15 μm diam, not

conspicuously incrustated. Epicutis with a well developed gelatinous pellicle of narrow (1.5-3 μm) hyaline hyphae. Hypodermium subhyaline to cinnamon brown with more or less elongate hyphae to globose elements. Clamp connections present.

HABITAT AND DISTRIBUTION. Solitary or scattered on rotten wood or twigs, on grass stems or on manured soil or very rotten dung, at the margin of the forests or in open forests, mainly coniferous. Known from Europe (where it seems very common) and Canada, U.S.A., Alaska and Greenland (see p. 188). Fruiting in summer.

STUDIED MATERIAL. CANADA, New Brunswick, Kouchibouguac Nat. Park, *Red-head 2711* (DAOM 169914; ENCB).

U.S.A., California, San Francisco, *Leslie 4236* (ENCB). Berkeley, *Morse M-606* (BPI); *Moser* s.n. (Feb. 1, 1940) (MICH). Santa Barbara, *Henr* s.n. (12-4-74) (ENCB). Idaho, McCall, Granite Twin Lakes area, *Smith 59050* (MICH). Michigan, Emmet, Wilderness State Park, *Smith* (MICH). Silver Lake, *Smith 200370* (MICH). Lake Crescent, *Smith 14039* (MICH). New York, N.Y. Botanical Garden, *Murrill* s.n. (Jun. 6, 1910) (NY, type of *P. caespitosa*). Oregon, Rouge River, *Leslie 4015* (ENCB). Pennsylvania, Pittsburgh, *Sumstre 142* (MICH). Washington, Whitman, Union Flat Creek, *Cooke 19875* (MICH).

BELGIUM, Luxemburg, Tenneville, Rouge Ponceau, *Darimont* s.n. (15-X-1909) (LG as *Deconica inquilina*).

CZECHOSLOVAKIA, Pelesany, *Hernik* s.n. (PR 608695).

DENMARK, Sjaell, Sondermøgen, *Christiansen 6158* (C).

GREAT BRITAIN, West Sussex, Bignor Hill, *Reid* s.n. (May 26, 1969) (K, ENCB).

HUNGARY, Mts. Budai, Budapest-Pesthidegkút, *Bohus & Babos* s.n. (BP 48451 & 48452).

SWEDEN, Smaland, Femsjö, *Lundell 1149* (UPS, BPI, PR); *Lundell & Haglund 5460* (UPS). Västergötland, Göteborg, *Nathorst-Wildahl 2483* (GB).

DISCUSSION. *P. physaloides* has been interpreted in different ways and often confused with *P. montana* (Pers. ex Fr.) Kumm., *P. inquilina* (Fr. ex Fr.) Bres. and *P. crobula* (Fr.) M. Lange ex Sing. However, the thick walls of the spores of *P. montana* separate it from *P. physaloides*. The poorly developed veil as well as the short cheilocystidia seems to delimit *P. physaloides* from *P. crobula*. The large spores of *P. inquilina* easily distinguishes it from *P. physaloides*. Lange (1955) wrote on *P. physaloides*: "this species is too often confused with *P. montana* to permit a fair evaluation of its distribution". Konrad & Maublanc (1924-1937) excluded *P. physaloides*. Guzmán & Vergeer (1978) at first considered *P. physaloides* a doubtful species. The fungus described by Horak (1968) as *P. physaloides*, with spores 6-9.5 × 4-6 μm and cheilocystidia 25-40 × 3-7 μm, may belong to *P. inquilina*. The concept of *P. physaloides* of Kühner & Romagnesi (1953) is very confused. *P. physaloides* sensu Bresadola (1931, pl. 866, fig. 1) is *P. xeroderma* Huijs. according to Huijsman (1961), as will discuss belong.

The concept of *P. physaloides* followed here is based on Quélet's (1872) interpretation, followed by Moser (1967), Lundell (Herb. material at UPS) and Reid (Herb. material at K). The var. *substerilis* Lange surely is a synonym of the type. Lange (1936) based that taxon on some materials "almost devoid of spora", otherwise it is the same as the type variety.

P. physaloides seems to be very common in Europe; the following are the reports of this species from different European countries: Berekely & Broome (1837-1885), Smith (1908), Ricken (1915, 1920), Velenovski (1920), Pereira-Coutinho (1931), Lange (1936; 1939), Romagnesi (1936), Möller (1945), Bataille (1948), Straus (1959), Schulmann (1960), Pegler (1966b), Moser (1967), Orton (1969), Watling & Richardson (1971) and Bresinsky and Haas (1976). From North America there are only reports the from Greenland (Lange, 1955), Alaska (Sprague & Lawrence 1960), and New York (Murrill, 1923, as *P. caespitosa* Murr.). Smith (1948) studied this latter type. Murrill's fungus has the taxonomic features of *P. physaloides*, as the author studied in the type: Spores $6.5-7.5 (-8) \times 4.4-5.5 \mu\text{m}$, subrhomboid, moderately thin walled, pleurocystidia absent and cheilocystidia $18-28 \times 4-6 \mu\text{m}$, subfusoid or fusoid.

The name *P. physaloides* is derived from Greek and means bladder-like, referring to the form of the pileus.

SELECTED ILLUSTRATIONS. Laplanche (1894) cited the illustrations of Britzelmayer (Melanospor. f. 115), Bulliard (t. 566, f. 1), Cooke (t. 609, f. A), and Sticard (Hist Nat. Champ., t. 20, f. 90).

52. *Psilocybe pteridophytorum* Sing. *Mycologia* 51: 582, 1959. Figs. 320-321

Pileus about 5 mm in diam., convex, not umbonate, glabrous, even but short and indistinctly striate, viscid, hygrophanous, deep dark brown, fading to brownish.

Lamellae broad adnate, brownish to brown, subdistant.

Stipe about 20×1 mm, uniform in diameter, paler than pileus to dark brown when fading.

Veil cortinate, rudimentary in the adults as white fibrils on the extreme margin of the pileus, not striking.

Context partly dull brownish, without any distinctive odor.

Spores $(6-) 7.5-8 (-8.5) \times 4.5-5 \times 3-4.5 \mu\text{m}$, subellipsoid or subrhomboid in face view, ellipsoid in side view, thick walled yellowish brown, with a broad germ pore.

Basidia 4-spores, hyaline, ventricose.

Pleurocystidia absent.

Cheilocystidia $25-35 \times 4.7-5.3 \mu\text{m}$, abundant, hyaline, sublageniform, neck flexuous, $1-2 \mu\text{m}$ broad, apex often with a globose hyaline mucilaginous head which is very fugacious.

Subhymenium brownish with incrustated pigment. Trama parallel, hyaline or brownish. Epicutis a subgelatinous thin and hyaline layer or repent hyphae. Clamp connections present.

HABITAT AND DISTRIBUTION. Solitary on a fallen thallus of a fern in a subtropical mountain forests. Fruiting in February. Known only from the type locality.

STUDIED MATERIAL. ARGENTINA, Prov. Tucuman, Rio de los Sosas, Singer T-2132 (BAFC Type) (Singer, 1969b, pointed out LIL as the Herbarium holding the type, but the author did not find any *P. pteridophytorum* there).

DISCUSSION. This species is very close to *P. montana* (Pers. ex Fr.) Kumm., as was discussed. The type material (the only herbarium material) is one specimen in bad condition. Singer's description (1959b) is very short with no data on subhymenium, epicutis and hypodermium. Singer (*op. cit.*) wrote: "This banal-looking little species is apparently well separated from related species of the same group, i.e. *Deconica*". He described spores $7.8-8 \times 4.7-5.2 \mu\text{m}$.

The name of the species means the substratum (a fern) where the type was found.

53. *Psilocybe rhomboidospora* (Atkinson) Smith ex Guzmán comb. nov.

Figs. 326-328

Deconica rhomboidospora Atkinson, *Ann. Myc.*, 7: 368, 1909.

Pileus 0.5-1.5 mm in diam., convex to obtusely conic, umbonate to plane expanding in the adults, at times the margin recurved, at first with scattered whitish flocci near the silky fibrillose margin, soon glabrescent, even but slightly striate at the margin when moist, surface lubricous to dry and hygrophanous, dark rusty to chestnut-brown, fading to yellowish brownish, clay-color or pale buff.

Lamellae adnate to adnexed or subdecurrent, dark chestnut brown with a purplish tinge at maturity, edges white and fimbriate.

Stipe $20-30 \times 1-2$ mm, equal, hollow, straight or flexuous, more or less whitish to concolorous with pileus throughout, or with a vinaceous tinge, surface at first often appearing paler at least over lower portion because of adhering veil remnants, glabrous above, base white-mycelioid and mycelium often extending for some distance over substratum.

Veil not well developed, only evident in young specimens as whitish appendiculate fibrils that soon disappear.

Context thick at the pileus, pliant and pale brownish, somewhat fibrous at the stipe. Odor none, taste slightly mealy.

Spores (5-) 6-7 (-8) $\times$ 4-5 (-6) μ m, subrhomboid or rhomboid in face view, ovate to ellipsoid in side view, yellowish brown with a more or less small hyaline apical pore.

Basidia 4-spored, some 2-spored, 16-24 $\times$ 6-6.5 μ m, hyaline, subventricose-pyriforme.

Pleurocystidia absent.

Cheilocystidia 40-60 $\times$ 7-8 μ m, hyaline, abundant, forming a sterile band, subclavate at first but then subventricose-subcylindric and flexuous, with a greatly elongated often flexuous neck 2-2.5 μ m wide, and with a hyaline mucilaginous drop at the apex 3-10 μ m wide.

Subhymenium hyaline with more or less globose elements, somewhat incrustated with brownish pigment. Trama with parallel hyphae, pale to dark yellowish brown. Epicutis formed by a very thin, poorly developed pellicle to dark yellowish brown or cinnamon brown, with elongated to subglobose hyphae, thin walled, somewhat incrustated on the walls. Clamp connections present.

HABITAT AND DISTRIBUTION. Scattered or in small groups (2-3) on leaves, rotten wood, or debris, in deciduous woods. Known only from the type locality, and also probably from Massachusetts (U.S.A.) (see discussion).

STUDIED MATERIAL. U.S.A., New York, Ithaca, Cayuga Lake Basin, South of Beebe Lake, *Jackson* s.n. (Jun. 5, 1904) (Type, CUP 18245 CUP).

DISCUSSION. The type is deposited in CUP as *Deconica* sp. accompanied with the notes of Atkinson. Both specimens and notes were kindly sent to the author by the Curator of Cornell Univ. Herbarium, Mrs. Patricia M. Fazio. This is certainly the type of Atkinson's species. Smith studied this material in 1937 and he considered it to belong to the genus *Psilocybe*, according to his unpublished notes which he kindly sent to the author. Smith reported (in his notes) *P. rhomboidospora* from Michigan, but Smith's specimens identified by Smith as *P. rhomboidospora*, belongs to *P. phyllogena* as the author studied in MICH. Murrill (1922) commented on this species without studying the type.

Atkinson (1909) reported cheilocystidia 60-70 $\times$ 7-9 μ m, but the author of this monograph only found them 40-60 μ m long in the type. This species is close to *P. phyllogena* (Peck) Peck but that species has short cheilocystidia, not more than 37 μ m long, and the pileus is subviscid or viscid. The material reported by Bigelow (1978) as *P. rhombospora* (Britz.) Sacc. from Massachusetts (U.S.A.) very probably is *P. rhomboidospora* for the cheilocystidia described (35-50 μ m long). One collection from Maine (U.S.A.) at MICH determined as *P. rhomboidospora* by Rea (H-556) is actually a *Psathyrella* sp.

The name of the species refers to the form of the spores, so typical in all species of the Section.

55. *Psilocybe schoeneti* Bresinsky *Hoppea* 35: 104, 1976.

Hut: 1-2,5 z. T. auch fast 3 cm im Durchmesser erreichend, im ganz jungen Zustande glockig mit stumpfem Scheitel, dann breit gewölbt mit mehr oder minder deutlichem Buckel und herabgeschlagenem Rande; schließlich kegelig oder auch halbkugelig mit Buckel, der selten fehlt; endlich auch völlig ausgebreitet und flach mit kaum sichtbarer buckelförmiger Erhebung. Hutrand ganz junger Stücke kaum gerieft, später jedoch und besonders im Alter auf 1/3 bis 1/2 des Hutradius, z. T. auch bis gegen das Zentrum durchscheinend gestreift; zuletzt gerade, an älteren Stücken auch aufwärtsgebogen, scharf, z. T. etwas flatterig, jedoch vorherrschend eben. Ein faseriges bräunlichweißes Velum verbindet den noch eingerollten Hutrand sehr junger Exemplare mit dem Stiel; nach dem Aufschirmen bleiben vom Hutrand abstehende, weißliche Zähnnchen erhalten, jedoch nur so lange, wie der Hut noch relativ jung und unversehrt ist; teilweise liegen auf der Hutoberfläche in regelmäßigen Abständen kleine Schüppchen in der Nähe des Hutrandes anstelle der abstehenden Zähnnchen. Velumbelag auf der Hutoberfläche z.T. auch glimmerig glänzend. Im übrigen ist die Hutoberfläche feucht schwach glänzend und unter der Lupe feinst grubig strukturiert, hygrophon, vom Zentrum her austrocknend und heller werdend. Merkmale der Hutdeckschicht trotz gezielter Beobachtungen an verschiedenen Altersstadien und an sehr frischem Material nicht eindeutig: Huthaut nicht deutlich gelatinös dehnbar, meist nur faserig aufbrechend, z. T. auch als dünnes durchsichtiges Häutchen abziehbar. Wenn genügend frischer und junger Hut gespalten wird, erkennt man eine zusammenhängende, dünne, mäßig dehnbare Deckschicht. Die Dehnbarkeit der Huthaut ist bei unserem Pilz variabel und weder ein besonders deutlich ausgeprägtes, noch zuverlässiges Merkmal. Farben des Hutes: zunächst rötlich - ockerbraun, dann rötlichbraun, z. T. in auffallender Weise mit rötlicher Komponente in der Braunfärbung, ältere Exemplare an den durchfeuchteten Stellen sehr bald schmutzig braun bis olivlich braun; hellbraun bis grauocker trocknend und der dunkler bleibende Rand gegen die hellere Scheibe kontrastierend; 6 E 7 Kornenip & Wanscher; Methuen Handbook of Colour (jung); 7 D 8 + C 10; Die Angaben nach + = Locquin, Chromotaxia 7 D 8 + C 05; 6 D 8 + B 05 (gegen den Rand); 7 E 6 (stellenweise); 7 E 8 (Mitte), 6 D 7 + R 05 oder 6 D 7, 6 E 7 (Scheibe); 6 F 6 (Rand); ältere, olivlich braun gefärbte Hüte: 6 D 4 + Y 05; 5 C 6; austrocknend: 2 A 5 + M 05 (etwas heller), 4 A 3, 5 A 3 + Y 05, Ség. 199. Ségu; Code de Collars).

Lamellen: breit angeheftet und am Stiel etwas herablaufend, breit (3,5 mm gegenüber dem nur 1 mm dicken Hutfleisch), untermischt, ziemlich gedrängt und dadurch Hutgrund kaum sichtbar; weder gegabelt noch anastomosierend. Lamellenfläche eben, ohne Queradern, beim Trocknen fleckig werdend, d. h. mit helleren Flecken in der überwiegend rötlich braunen, teils auch heller braunen oder auch umbrabraunen oder schokoladebraunen Färbung: 6 E 6; 6 E 6 + R 025; 6 D - E 6. In Aufsicht heller gefärbt: 6 D 6, 5 D 5. Schneide schwach bauchig, geschweift, z. T. auch etwas konkav, bräunlich-weiß flockig und gegen die dunkler gefärbte Fläche oft auffallend kontrastierend.

Stiel: 3-4-5,5 $\times$ 0,2 (-0,3) cm, teils ziemlich gerade, teils verbogen, $\pm$ gleichdick bzw. Basis etwas keulig. Velum flüchtig, keinen Ring bildend. Oberfläche durch helle Streifen weißlich-faserig bedeckt, gegen die Stielspitze flockigfilzig bis fein

bereift, und zwar zum Lamellenansatz hin zunehmend dichter; im übrigen undeutlich zottig, aber Substratmantel kaum ausgeprägt. Farbe: zunächst wie die des Hutes, durch Abgreifen jedoch dunkler, schwarzbraun, so besonders von der Mitte aus gegen die Basis; gegen die Spitze oft heller, silbrigbraun.

Fleisch: ohne Geruch, Geschmack mild bis etwas adstringierend. Fest im Stiel, eine zentrale Höhlung aussparend, mit etwas faseriger Innenwand. Im Hut dünn (1 mm), trocknend weißlichbraun gefärbt.

Sporenstaub: purpurbraun (6 F 5) bis tiefbraun (5 F 5).

Mikromerkmale: Basidien 4-sporig; Sporen, in KOH beobachtet, ziemlich dunkelbraun gefärbt, in der Färbung etwa *Agaricus*-Sporen vergleichbar, mit deutlichem Keimporus. (6,5) 7,5-8-8,5 $\times$ 4,5-5 (-5,2) $\times$ (5-) 5,5-6 μ m, in Frontansicht deutlich breiter als im Seitenprofil. Cheilozystiden (21-35 $\times$ 7-13 $\times$ 3-4 μ m) flaschenförmig, relativ kurz und gedrungen. HDS ADS = Hutdeckschicht außen hyalin aber nicht deutlich und scharf gegen tiefere Schichten des Hutes abgegrenzt.

Vorkommen: in Flachmoorwiesen, vorzugsweise im Primulo-Schoenetum bei *Schoenus ferrugineus* wachsend, seltener mit *Trichophorum cespitosum*. Die Fruchtkörperbildung setzt jährliche Streumähd der Bestände (Streuweisen!) voraus. Teilweise ist die Fruktifikation in Hexenringen charakteristisch. Meist sind die einzelnen Fruchtkörper zudem büschelig gehäuft (bis zu 6 Exemplare). Das Myzel entspringt dem humosen Boden und steht nicht mit Mist und meist auch nicht mit toten Pflanzenresten in Verbindung. Der Stielgrund ist vielmehr oft mit Sumpfmossen, z. B. mit *Campylopus stellatus*, *Climacium dendroideum* und *Drepanocladus* spec. verbunden. Die Art fruktifiziert nicht ausschließlich in Beständen von *Schoenus*, kommt aber doch vorwiegend in oder in der Nähe von gemähten Schoeneten vor. Sie wurde vom Autor nur im Mai und Juni fruchtend gefunden.

HABITAT AND DISTRIBUTION. Gregarious on soil or humus in open places of coniferous forests. Known only from Central Europe.

STUDIED MATERIAL. SWITZERLAND, between Wiesen und Filisur, Southwestern of Davos, Guzmán 9482 (ENCB).

DISCUSSION. This species is close to *P. xeroderma* Huijs. but differs in the form of the cheilocystidia. It is also close to *P. inquilina* but the spores and the cheilocystidia are different. In spite the type was not studied *P. schoeneti* is a good species based on the description of Bresinsky (1977) considered here, as well as the excellent color plate by Bresinsky. The only studied material agrees more or less well with Bresinsky's description; it has spores 6.2-7.7 (-8.5) (-9.3) $\times$ (3.8-) 4.6-5.2 (-6.2) μ m, moderately thick walled (0.8 μ m); pleurocystidia absent; cheilocystidia 23.2-35.6 $\times$ 7.7-10 μ m, hyaline, sublageniform or subfusiform with short or some long necks, 3.1-3.8 μ m wide, and subhymenium with incrustated pigment on the walls. The spore print is dark violaceous brown.

The name of the species refers to the habitat where it grows, in plant communities with *Schoenus ferrugineus* (a Cyperaceae).

SELECTED ILLUSTRATIONS. Bresinsky (1977, pl. 1, above).

56. *Psilocybe semistriata* (Peck) Guzmán, comb. nov.

Figs. 329-335

Deconica semistriata Peck, Ann. Rep. N. Y. St. Mus. 51: 291, 1898.
Psilocybe chionophila Lamoure, Bull. Men. Soc. Linn. Lyon 46 (7): 215, 1977.
P. tenax (Fr.) Kühner & Romagn., sensu Fábry, Ceska Myk. 31: 37, 1977.

Pileus (4-) 8-10 (-17) mm in diam., convex to subumbonate, becoming somewhat plane or subcampanulate, glabrous, the margin at first with minute white fibrillose flecks left by the white rudimentary veil; surface even, striate by transference when moist, somewhat undulate or sulcate in dry specimens, subviscid, hygrophanous, purplish-brown, rufous-brown, grayish brown or umber brown, fading to alutaceous, nearly avellaneous or beige.

Lamellae broadly adnate to slightly decurrent, purplish-brown paler to dark, with whitish edges.

Stipe (12-) 25-30 (-45) $\times$ 1-1.5 mm, equal or somewhat thick at the apex, slightly floccose-fibrillose stuffed with a whitish pith, whitish or colored like the pileus, or paler; sometimes with dark reddish brown tints above, faintly pruinose, sparsely fibrillose downward from the remains of the rudimentary veil; base with appressed pallid mycelium.

Veil cortinate and rudimentary, leaving fine appressed silky fibrils.

Context thin at the pileus, paler than the surface. Taste and odor mild. KOH stains the pileus dark brown-reddish.

Spores (6.6-) 7.7-8.8 (-9.9) $\times$ 5.5-7 (-8) $\times$ 4.9-5.5 μ m, rhomboid or subrhomboid in face view, subellipsoid in side view, thick (1 μ m) walled yellowish purple brown, with a broad and plane germ pore.

Basidia 15-28 $\times$ 6.6-7.7 μ m, 4-spored, hyaline, subventricose or subpyriform, sometimes with a median constriction.

Pleurocystidia absent.

Cheilocystidia (16-) 26-36 $\times$ 4.8-6 μ m, abundant, hyaline, fusoid-ventricose or sublageniform, with a somewhat flexuous neck, 2-4 μ m thick, frequently with a hyaline viscous drop at the apex.

Subhymenium subcellular, subhyaline irregularly incrustated with brown-yellow pigment on the walls like that described in *P. montana*; elements 5-8 μ m diam. Trama parallel, hyaline or pigmented cinnamon-brown, with hyphae up to 20 μ m diam., brown-yellow. Lactiferous hyphae are observed in the trama and subhymenium. Epicutis formed by a subgelatinous thin layer of hyaline hyphae, up to 4 μ m diam. Hypodermium subcellular, like the subhymenium, in color and incrustations. Clamp connections present.

HABITAT AND DISTRIBUTION. Solitary or scattered in small groups in humus covered by mosses (mainly *Polytrichum*), sometimes among lichens, in deciduous or conifer forests, in subalpine or alpine zones. Known from Alaska, United States and Europe. Fruiting in summer.

STUDIED MATERIAL. GREENLAND, Hassell Fjeld, *Lange 129* (C as *Psilocybe* sp.)

U.S.A., Idaho, Borner, *Smith 67862* (MICH). Maine, Canton, *Parlin 17116* (FH as *Deconica atrorufa*). Michigan, Oakland, near Pontiac, *Smith 6358* (MICH). New York, Gansevoort, *Peck* s.n. (NTS Type).

BELGIUM, Ravelskamp, Turnhour, Antwerpen, *Darimont* s.n. (5-X-1943) (LG as *Deconica atrorufa*). Robertville, Fagne Wallonne, *Darimont* s.n. (7-VIII-1950) (LG).

GREAT BRITAIN, Somerset Newcombme, *Smith 61157* (MICH as *P. semilanceata*) (it does not agree well with *P. semistriata* for the size of the spores: $8.8-11 \times 6.6-7.7 \mu\text{m}$, but sure it is not *P. semilanceata*).

CZECHOSLOVAKIA, Slovensku, *Fabry 221-1970* (BRA as *P. tenax*).

DENMARK, Boto, *Möller* s.n. (10-11-1940) (C as *P. atrorufa*).

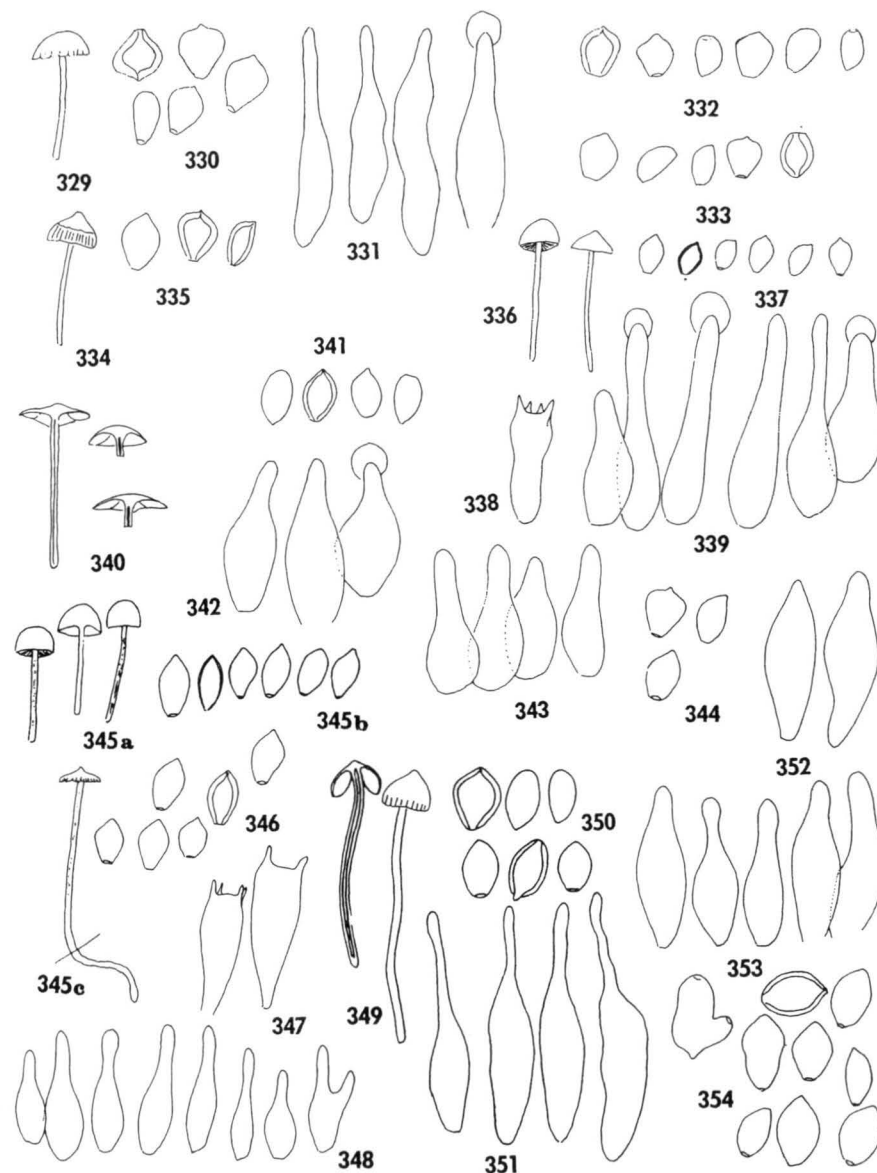
FRANCE, near Lyon, Le Plan des Eaux, *Lamoure* s.n. (1-9-73) (LY, 73-146, as *P. chionophila*).

DISCUSSION. This species is very close to *P. montana* (Pers. ex Fr.) Kumm. differing in the broad spores. *P. chionophila* Lamoure is a synonym of *P. semistriata* (based on the study of a collection of Lamoure which was kindly sent to the author). Lamoure (1977) separate *P. chionophila* from *P. montana* only by the broad spores. It is probable that many collections of *P. montana* in different herbaria belong to *P. semistriata*. The spores showed by Singer (1949, 1962, 1975) as *P. montana* probable belongs to *P. semistriata*. Guzmán & Vergeer (1978) first considered *P. semistriata* as a synonym of *P. montana*. The reference of Kobayasi *et al.* (1967) of *P. montana* from Alaska clearly belongs to *P. semistriata* because of its spores; some materials of Lange & Kifte (1967) are possibly also *P. montana*. *P. semistriata* is also close to *P. bullacea* (Bull. ex Fr.) Kumm. (q.v.).

The name refers to the substrate pileus which is more or less conspicuous in this fungus.

SELECTED ILLUSTRATIONS. Probable Singer (1975, pl. 13; spores, as *P. montana*).

Plate 26: Figs. 329-354. - Several species of *Psilocybe*. 329-335: *P. semistriata*, 329: Carpophores, 330: Spores, 331: Cheilocystidia, 332 & 333: Spores, 334: Carpophore, 335: Spores (329-331: type; 332: type of *P. chionophila*; 333: Darimont; 334-375: Parlin 17116). 336-339: *P. smithiana*, 336: Carpophores, 337: Spores, 338: Basidium, 339: Cheilocystidia (all from the type). 340-342: *P. xeroderma*, 340: Carpophores, 341: Spores, 342-343 Cheilocystidia, 344: Spores (340-342: type; 343-344: Hesler). 345A-B: *P. fimicola*, A: Carpophore, B: Spores (both from type). 345C-348: *P. armandii*, 345: Carpophore, 346: Spores, 347: Basidia, 348: Cheilocystidia (all from the type). 349-351: *P. acutipilea*, 349: Carpophores, 350: Spores, 351: Cheilocystidia (all from the type). 352-354: *P. subaeruginascens* var. *septentrionalis*, 352: Pleurocystidia, 353: Cheilocystidia, 354: Spores (all from the type).



57. *Psilocybe smithiana* Guzmán, sp. nov.

Figs. 336-339

A *Psilocybe nothofagensis* Guzmán et Horak affini differt subhymenium hyalinum sine crusto septa. Typus Smith 63667 (MICH).

Pileus 5-15 mm in diam., convex to subumbonate, more or less plane in the adults specimens, subviscid, glabrous, even but somewhat striate at the margin when moist, hygrophanous, brown-reddish, fading to straw color or alutaceous.

Lamellae broadly adnate, russet cocoa or reddish-brown, with whitish and subfloccose edges.

Stipe 30-40 × 1-2 mm, equal or subbulbous, hollow, whitish to grayish, fibrillose, covered by whitish floccose fibrils from the veil.

Veil rudimentary as a fugacious white cortina.

Context thin somewhat pliant and pale brownish at the pileus. No odor and taste checked.

Spores (5-) 5.5-6.6 (-7) × 3.8-4.4 μm, subrhomboid in face view or subellipsoid in side view, pale brownish, thin walled with a broad plane germ pore.

Basidia 17-19 × 5.5-7 μm, 4-spored, subventricose or subpyriforme, hyaline.

Pleurocystidia absent.

Cheilocystidia 14-25 × 5.5-6.6 μm, abundant, hyaline, lageniform or sublageniform, with a neck 3.3-4.4 μm diam., frequently with a viscous hyaline drop at the apex.

Subhymenium subcellular, hyaline to brownish pale, without incrustated pigment. Trama regular, with parallel hyaline to brownish hyphae. Epicutis formed by subgelatinous, thin hyaline layer of elongated hyphae. Hypodermium with elongated parallel hyaline or brownish hyphae, with diffused pigment. Clamp connections present.

HABITAT AND DISTRIBUTION. Scattered on rotten wood, in deciduous or coniferous forests. Known from the eastern United States and Sweden. Fruiting in summer.

STUDIED MATERIAL. U.S.A., Michigan, Harbor Spring Hills, Smith 63667 (MICH Type).

SWEDEN, Backa, Västergötland, Karlslund 2066 (UPS as *Psilocybe* sp.).

DISCUSSION. The small spores distinguish this species from others in the Section *Psilocybe* known in the United States and Europe. However it is close to *P. nothofagensis*, known only from New Guinea, but that species has a strongly incrustated and pigmented subhymenium, as does *P. montana*. Smith, when studying the European material considered here, wrote that it perhaps is a new species close to *P. physaloides* (Bull. ex Mér.) Quél. or *P. castanella* Peck.

The name of this species is in honor of Dr. Alexander H. Smith, one of the mycologists on higher fungi more prominent in the present time. He also collected the type.

58. *Psilocybe xeroderma* Huijsm. *Persoonia* 2: 94, 1961.

Figs. 340-342

P. physaloides (Bull. ex Mér.) Quél. sensu Bresadola, *Icon. Myc.* Vol. 18, pl. 866, fig. 1, 1931.

Geophila hyperella (Fr.) Kühn. & Romag., *Fl. anal. champ. sup.*, p. 339, 1953, not *Agaricus hyperellus* Fr., *Elench. Fung.* 1: 35, 1828.

Pileus (5-) 8-16 (-20) mm in diam., convex to more or less conic or subumbonate, then subplane, glabrous, not viscid, margin fibrillose, with whitish evanescent fibrils, and striate when humid, hygrophanous, reddish brown to chocolate brown, dry to brownish alutaceous or straw color.

Lamellae broadly adnate, reddish brown or chocolate color, with whitish or pale crenulate, fimbriate-serrulate or floccose edges.

Stipe (15-) 20-40 × 1-2 mm, subflexuous, equal or subequal, hollow, subfloccose-pruinose from the whitish fibrillose remnants of the veil, whitish yellow or brownish to reddish brown when touched or in age.

Veil ample, fibrous and evanescent, not forming an annulus even in young specimens.

Context thin or moderately thick and fragile at the pileus, paler than the surface, subconcolorous in the stipe. Odor and taste mild.

Spore print blackish purple.

Spores (5.4-) 6-7 (-8.4) × 4.4-6 × 3.6-4.8 μm, subrhomboid or submitriform in face view, subellipsoid in side view, brownish, more or less thick (0.5 μm) walled, with a broad plane germ pore.

Basidia 16-23 × 5-7 μm, 4-spored, subclaviform or subventricose, hyaline.

Pleurocystidia absent.

Cheilocystidia 24-35 (-40) × (5-) 7-12 (-15) μm, hyaline, abundant, forming a sterile band, subfusiform, or sublageniform, or ventricose mucronate, with a short neck.

Subhymenium obscurely subcellular, hyaline to yellow-brown, with incrustated pigment irregularly on the walls. Trama parallel, brownish, with elongated hyphae up to 20 μm diam., some with incrustated brown pigment. Lactiferous hyphae, orangish brown, 5-10 μm and vermiform, more or less common in the subhymenium. Epicutis formed by a thin layer of elongated no gelatinous, hyaline, thin walled hyphae. Hypodermium orangish-brown to hyaline, with elongated to subglobose 5-22 μm diam., thin walled hyphal cells. Clamp connections present.

HABITAT AND DISTRIBUTION. Subcaespitose or scattered on debris in open forests of conifers or in lawns. Common in the Jura region of France and Switzerland, known also from the eastern United States. Fruiting in May and June.

STUDIED MATERIAL. U.S.A., Tennessee, Knoxville, Colonial Village, Hesler s.n. (TENN 17466 as *Psilocybe* sp.)

FRANCE, Lougres, near de Montbéliard, Doubs, Huijsman s.n. (Type L 956.110-431).

DISCUSSION. This species is close to *P. physaloides* (Bull. ex Mér) Quél. but differs in the broad cheilocystidia (5-7 μm diam. in that species), as well as in the size of the spores. It is also close to *P. schoeneti* Bresinsky but the form of the cheilocystidia in that species is sublageniform with a subflexuous neck. This species was reported by Orton (1969) with spores 5-7 (-8) $\times$ 3.5-5 $\times$ 4.2-5.5 μm , growing on conifer needles or other herbaceous debris. Huijsman (1961) described *P. xeroderma* based in the dry not viscous pileus, without gelatinous epicutis, and he based also in the size of cheilocystidia and spores. The specimen from U.S.A. is the first report of this species outside of Europe.

The name of the species is related to the dry structure of the pileus.

SELECTED ILLUSTRATIONS. Bresadola (1931, pl. 866, fig. 1). Huijsman (1961, figs. 12-14).

Sect. *Mexicanae* Guzmán, sect. nov.

Sporis subrhomboideus plus quam 8 μm longae crassis tunicatis. Hyphae tramae hyalinae vel subfulvae tenui tunicatis. Sporophorum Mycenae et Collybiae similiter. Typus. *Psilocybe mexicana* Heim.

Spores subrhomboid in face view, subellipsoid in side view, thick walled ($\pm$ 1 μm thick), large, more than 8 μm long. Hyphae of the trama hyaline or yellowish, thin or moderately thick walled. Sporophores mycenoid or collybioid. Type species: *Psilocybe mexicana* Heim.

This Section is very close to Sect. *Cordisporae* Guzmán, but the species of the latter have spores no more than 8 μm long and the hyphae of the trama are frequently thick walled and irregularly and strongly incrustated with orange brown pigment. All species of Section *Mexicanae* turn blue, and are common in subtropical regions, rare in the tropics. The bluing, as well as the taste and flavor, probably means that all the species of the section are hallucinogenic. *P. mexicana* Heim is one of the most important hallucinogenic species used by the Mexican Indians, and *P. tampanensis* is known as a hallucinogenic species in the U.S.A.

Species considered: 59. *P. acutipilea* (Speg.) Guzmán; 60. *P. armandii* Guzmán & Pollock; 61. *P. farinacea* Rick ex Guzmán; 62. *P. galindii* Guzmán; 63. *P. mexicana* Heim, and 64. *P. tampanensis* Guzmán & Pollock.

Key to species

- 1a. Pileus conic or subumbonate (mycenoid)..... 2
- 1b. Pileus convex (collybioid)..... 5
- 2a. Spores (7-) 8-9.5 (-11) μm long..... 3
- 2b. Spores (8-) 8.8-12 (-14) μm long..... 4
- 3a. Cheilocystidia 11-12 $\times$ 3.3-5.5 μm long. Species known only from south-eastern Mexico..... 60 *P. armandii*
- 3b. Cheilocystidia 15-28 $\times$ 5-8 μm long. Species known only from southern Brazil..... 59. *P. acutipilea*
- 4a. Stipe without pseudorhiza. Spores (7.7-) 8.8-9.9 (-12) μm long. Widespread species in Mexico and Guatemala subtropics..... 63. *P. mexicana*
- 4b. Stipe with pseudorhiza. Spores (8.1-)9.6-12 (-14) μm long. Known only from the State of Jalisco (Mexico)..... 62 *P. galindii*
- 5a. Cheilocystidia 16-22 $\times$ 4-9 μm . Pileus not more than 24 mm diam. Species known only from southeastern U.S.A..... 64. *P. tampanensis*
- 5b. Cheilocystidia 22-33 $\times$ 5-7 μm . Pileus more than 24 mm diam. Species known only from southern Brazil..... 61. *P. farinacea*

59. *Psilocybe acutipilea* (Speg.) Guzmán *Mycotaxon* 7: 226. 1978. Figs. 349-351

Deconica acutipilea Speg., *Bol. Acad. Nac. Cs. Córdoba* 11: 381. 1889.

Pileus 7-10 mm in diam., globose to conic or conic-papillate, glabrous, even to somewhat striate at the margin, probably viscid and hygrophanous, brown to brownish, or straw color when dry.

Lamellae subadnate or sinuate, chocolate brown or violet brown, with whitish edges.

Stipe 50 × 1-2 mm, cylindric, equal, hollow, flexuous, whitish to yellowish, covered by floccose white fibrils, somewhat blackish-blue in the base.

Veil inconspicuous in the adult, except for the appressed silky fibrils on the stipe.

Context whitish in pileus, brownish in stipe; odor and taste not known.

Spores (7-) 8-9.5 (-11) × 5-6 (-7) × 4-5 μ m, subrhomboid in face view, ellipsoid or subellipsoid in side view, thick walled, brownish yellow, with a broad basal germ pore.

Basidia and pleurocystidia not observed (hymenium collapsed, it is possible that there are no pleurocystidia).

Cheilocystidia 15-28 × 5-8 μ m, hyaline, abundant, forming a more or less sterile band, ventricose-pyriforme with long necks 8-10 × 1-2 μ m.

Subhymenium and trama brownish yellowish with hyphae collapsed. Epicutis subgelatinized with hyaline elongated hyphae.

HABITAT AND DISTRIBUTION. Solitary on humus (*inter folia dejecta putrescentia*) in subtropical forests. Known only from the type locality (Fruiting in autumn).

STUDIED MATERIAL. BRAZIL, Apiaí (Apiahy), *Spegazzini 1536* (LPS 38307 Type).

DISCUSSION. This species is very close to *P. mexicana* Heim and possibly it is a South American variety of that. The only difference seems to be the narrow spores and the long necks of the cheilocystidia, but the sparse material (only one collection) makes further consideration impossible. *P. acutipilea* is also close to *P. armandii* Guzmán & Pollock, but the smaller and broader cheilocystidia delineates this species.

The name of the species is for the acute or papillate pileus.

60. *Psilocybe armandii* Guzmán & Pollock *Bol. Soc. Mex. Mic.* 13: 263, 1979.

Fig. 345C-348 and 718

Pileus about 10 mm diam., conic to subumbonate or papillate, glabrous, even, but slightly toward the margin when moist, lubricous (not viscid), hygrophanous, brown or brownish fading to pale alutaceous or ochraceous when dry.

Lamellae adnate or adnexed, dark violet brown, with floccose whitish edges.

Stipe 60 × 2 mm, equal, cylindrical, white, subfloccose, easily bluing where touch; with a rhizomorphic prolongation in the humus.

Veil inconspicuous in the adult, except for the appressed silky, white fibrils on the stipe.

Context thin, pliant and concolorous with the surface of the pileus; more or less fibrilous and dark brownish in the stipe. Taste and odor strongly farinaceous.

Spores (7-) 8-9 (-10) × 5.5-6.5 (-7) μ m, subrhomboid regular or irregular in frontal view, subellipsoid in side view, yellowish brown, thick walled, with broad germ pore.

Basidia 17-24 × 6.6-7.7 μ m, 4-spored, hyaline, fusoid-ventricose.

Pleurocystidia absent.

Cheilocystidia 11-22 × 3.3-5.5 μ m, abundant, forming a sterile band, hyaline, lageniform, with short or more or less long neck, sometimes branched.

Subhymenium no cellular, with parallel flexuous hyphae, having yellowish brown diffused pigment. Gill trama regular, hyaline to brownish, with elongated hyphae up to 10 μ m diam., thin walled. Epicutis formed by more or less gelatinized layer of hyphae, thin walled, parallel and hyaline. Hypodermium subcellular, up to 8 μ m diam., with diffused pale orangish brown pigment or somewhat incrustated and irregularly distributed. Clamp connections present.

HABITAT AND DISTRIBUTION. Solitary on humus in a *Quercus* forest of a tropical region ("encinar tropical"), at 60 m of altitude. Fruiting between June and July.

STUDIED MATERIAL. MEXICO, State of Oaxaca, Mitla to Totontepec, Amatepec, *Jacobs 6* (ENCB). State of Veracruz, south of Jaltipan (Minatitlán zone), *Guzmán 17470* (Type ENCB) (the specimen from Amatepec is a new record of the species).

DISCUSSION. *P. armandii* is close to *P. mexicana* Heim, but the smaller spores and narrow cheilocystidia, as well as the pseudorhiza, delineates this species. *P. armandii* together with *P. schultesii* Guzmán & Pollock are the known only *Psilocybe* species from the tropical *Quercus* forest, a very interesting ecological region for endemic species from a floristic point of view. Many fruit-bodies were obtained by culture from the type collection (Guzmán & Pollock, 1979) in a green-house of San Antonio, Texas (U.S.A.) (material deposited in ENCB).

The name of this species is in honor of Mr. Armando López, a Mexican young mycologist at INIREB, who helped the author in his field work in the tropics during 1976-1978.

SELECTED ILLUSTRATIONS. Guzmán & Pollock (1979, Figs. 1 & 4).

61. *Psilocybe farinacea* Rick ex Guzmán *Mycotaxon* 7: 241, 1978.

Figs. 355-357

Naucoria albofimbriata Rick, *Iheringia* 8: 393, 1961.

Naucoria tenax Fr. sensu Rick, *Iheringia* 8: 394, 1961.

Pileus 20-40 (-80) mm in diam., convex to subcampanulate, glabrous, even to slightly striate at the margin, subviscid to dry, brownish, fading to reddish brown or straw color.

Lamellae adnate or sinuate, violaceous brown or brownish chocolate, with whitish edges or these are concolorous with faces.

Stipe 35-65 (-80) × 3-8 mm, cylindrical, equal or subulbous, hollow, whitish to brownish, glabrous or with floccose fibrils at the apex, staining blue when injured.

Veil arachnoid, poor developed, leaving white to violaceous fibrils on the stipe, not forming an annulus.

Context whitish, staining blue when cut. Odor and taste farinaceous.

Spores 7.5-9 (-10.5) × 5.2-7.5 × 3-4 μm, subrhomboid in face view, ellipsoid in side view, thick walled, yellowish brown and with a broad basal germ pore.

Basidia 10-15 × 7-8 μm, 2- or 4-spored, ventricose, hyaline.

Pleurocystidia absent.

Cheilocystidia 22-33 × 5-7.5 μm, ventricose-fusiform with more or less long necks 2-3 μm diam., hyaline, forming a sterile band.

Subhymenium and trama brownish, with irregular more or less small elements (much of them observed collapsed). Epicutis formed a thin and subgelatinized layer of parallel hyaline hyphae. Hypodermium brownish, formed by parallel to globose hyphae, 8-10 μm diam. Clamp connections scarce.

HABITAT AND DISTRIBUTION. Gregarious on soil. Known from the type locality (collected in May), and from Sao Salvador (Brazil).

STUDIED MATERIAL. BRAZIL, Sao Leopold, Rick (Type, Lloyd Herb. 27598; BPI); Rick 52 (FH as *P. schaefferi* Rick nom nudum). Sao José, Leg. Bus (Rick 263, PACA 14551, as *Psilocybe* sp.). *Fungi Rickiani* 14128 (PACA 9081, type of *Naucoria albofimbriata*).

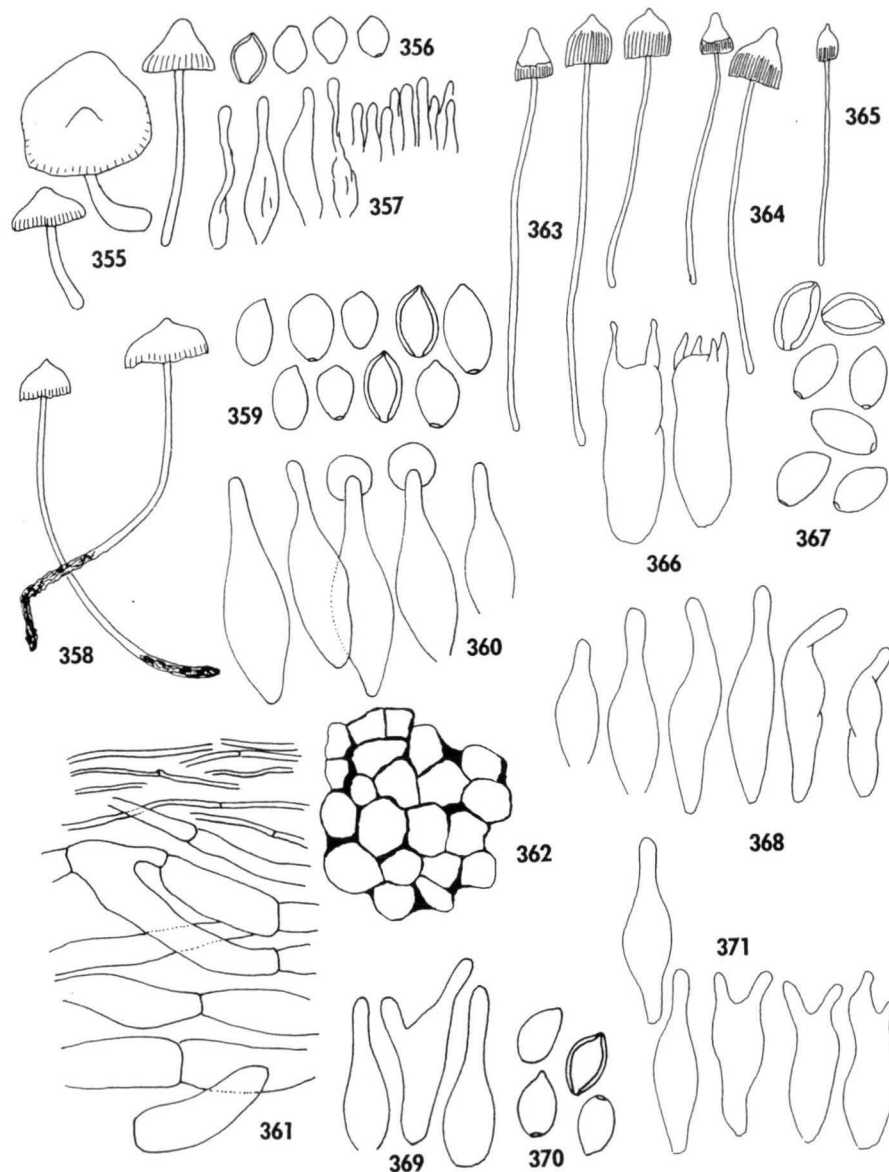


Plate 27: Figs. 355-371. - Several species of *Psilocybe*. 355-357: *P. farinacea*, 355: Carpophores, 356: Spores, 357: Cheilocystidia (all from the type). 358-362: *P. galindii*, 358: Carpophores, 359: Spores, 360: Cheilocystidia, 361: Pileus, 362: Trama (all from the type). 363-371: *P. mexicana*, 363-365: Carpophores, 366: Basidia, 367: Spores, 368-369: Cheilocystidia, 370: Spores, 371: Cheilocystidia (363: Guzmán 2115; 364 & 371: Guzmán 1874; 365: Guzmán 2060; 366-368: type; 369-370: Guzmán 10303).

DISCUSSION. *P. farinacea* is close to *P. tampanensis* Guzmán & Pollock and *P. caerulescens* Murr. but the size of the cheilocystidia readily separated this species from the former and for the size of the spores from the later. Its farinaceous taste and odor as well as the bluing indicate that this species may have hallucinogenic properties. *Naucoria albofimbriata* Rick is a synonym of *P. farinacea* based on the study of the type (PACA 9081, Rick 14128), a fungus described from Brazil, probably from also Sao Leopold. *Naucoria tenax* Fr. sensu Rick (see Rick, 1961) is certainly another synonym of *P. farinacea*, and this was described from Sao Salvador, Brazil.

The name of this species refers to the farinaceous taste (so typical in all the *Psilocybe* species with hallucinogenic properties).

62. *Psilocybe galindii* Guzmán *Nova Hedwigia* 29: 628, 1978. Figs. 358-362

Pileus 19-20 mm in diam., conic to campanulate or more or less umbonate, with a very slight papilla, glabrous, even to striate when moist, or sulcate-striate at the margin, subviscid but soon dry, hygrophanous, brown or yellowish brown fading to pale ochraceous or straw color.

Lamellae adnate, purpuraceous brown to dark brownish violet with whitish edges.

Stipe 50-65 × 1-2 mm, equal, hollow, whitish above, reddish brown in the middle portion to blackish brown at the base; with a long rhizomorphic prolongation (pseudorhiza) in the soil, 3-5 × 1-2 mm.

Veil inconspicuous, except for some white appressed silky fibrils on the pileus.

Context whitish ochraceous, staining green blue where injured or cut; odor and flavor farinaceous. KOH stains the pileus, stipe and context reddish brown, and finally blackish brown.

Spore print dark gray violaceous.

Spores (8.1-) 9.6-12 (-14) × (6.6-) 7.1-8 × 6-7 µm, subrhomboid in face view or sub-ellipsoid in side view, thick walled (± 1 µm) yellowish brown, with a broad germ pore.

Basidia 18-24 × 7.2-9.6 µm, hyaline, 4-spored, ventricose.

Pleurocystidia 14.4-21 × 7-8.4 µm, hyaline, fusoid-ampullaceous, with short necks.

Cheilocystidia 14-19 × (4.8-) 5.6-8.4 µm, hyaline, forming a sterile band, variable in form, usually like those of the pleurocystidia or lageniform with a neck 5-7 µm long; sometimes with an apical hyaline viscous drop and irregular branched.

Subhymenium hyaline but hyphae with incrustated yellow brown pigment irregularly distributed; all the elements are subglobose or more or less isodiametric in form. Trama regular, hyaline, with thin walled hyphae up to 20 µm diameter. Epicutis of filamentous hyaline hyphae, not very gelatinized, 2.8-5 µm diameter. Hypodermium with yellowish to hyaline hyphae, walls more or less thin (0.8-1.5 µm thick), 12-21 µm diameter.

HABITAT AND DISTRIBUTION. Gregarious in small groups, on soil among tall grasses, in open places of the *Pinus-Quercus* forests, between 1700-1800 m elevation. Known only from the type locality. Fruiting in July and August.

STUDIED MATERIAL. MEXICO, State of Jalisco, between Tamazula and Mazamitla, near Pie de la Cuesta, *Galindo-Arias* s.n., Jul. 13, 1974. (Type, ENCB; Isotype NY); near Tamazula, *Galindo-Arias* (Aug. 10, 1977) (ENCB).

DISCUSSION. This species is close to *P. mexicana* Heim, but the pseudorhiza and the slightly larger spores, as well as the type of vegetation where it grows, readily distinguishes this species. *P. mexicana* is common in grasslands of the deciduous forest regions, while *P. galindii* is only known from grasslands mixed with the *Pinus-Quercus* forest. The bluing and farinaceous taste and odor surely suggests this species has hallucinogenic properties.

The name of the species is in honor of Mr. Carlos Galindo Arias and his family, who collected the type, as well as other interesting mushrooms in the State of Jalisco (Mexico) gave to the author.

63. *Psilocybe mexicana* Heim *Rev. Myc.* 22: 77, 1957. Figs. 363-371, 651, 655-656, 707 & 763

P. mexicana f. *reflexa-conica* Heim & Cailleux, in: *Nouv. invest. champ. hallu.*, p. 138, 1967, nom. nud.
P. mexicana f. *galericulata-convexa* Heim & Cailleux, Idem, p. 138, nom. nud.
P. mexicana f. *galericulata-viscosa* Heim & Cailleux, Idem, p. 143, nom. nud.
P. mexicana f. *angulata-olivacea* Heim & Cailleux, Idem, p. 140, nom. nud.
P. mexicana f. *distorta-intermedia* Heim & Cailleux, Idem, p. 140, nom. nud.
P. mexicana f. *naviculata-viscosa* Heim & Cailleux, Idem, p. 144, nom. nud.
P. mexicana f. *grandis-gibbosa* Heim & Cailleux, Idem, p. 145, nom. nud.

Pileus (5-) 10-15 (-30) mm in diam., conic to campanulate or subumbonate, frequently with a slight papilla, rarely expanded, viscid to subviscid or lubricous, glabrous even to striate or sulcate-striate at the margin, strongly hygrophanous, brownish or deep ochraceous to fulvous or yellowish gray to beige or straw color when fading from the disc to the margin, sometimes with greenish or bluing tints.

Lamellae sinuate, adnate or adnexed, pale gray to dark violet brown with whitish subfloccose edges.

Stipe 40-100 (-125) × 1-2 (-3) mm, equal, sometimes slightly attenuate at the base, without a pseudorhiza, glabrous, hollow, silky, pale straw color to brownish or reddish yellow to reddish brown, darker when injured.

Veil thin, white, silky-fibrillose, soon evanescent, sometimes leaving finely appressed fibrils on the upper part of the stipe or on the margin of the pileus. Annulus absent.

Context brownish yellow in pileus and very thin; reddish brown in stipe; easily turning blue when injured. Odor and taste farinaceous.

Spore print dark violaceous brown or blackish purple brown.

Spores (7.7-) 8.8-9.9 (-12) $\times$ (5.5-) 6.6-7.7 (-8.2) $\times$ 6-7 μ m, regularly subrhomboid in face view, ellipsoid or subellipsoid in side view, yellowish brown, thick walled and with a broad germ pore.

Basidia 22-24 (-32) $\times$ 7.7-11 μ m, 4-spored, sterigmata 3.3-5 μ m long, hyaline, ventricose subpyriform, with a median or more superior constriction.

Pleurocystidia absent, or few are similar to the cheilocystidia (of the sublageniform type) and near the edge of the gill.

Cheilocystidia 13.2-28 (-34) $\times$ 4.4-6.6 (-8.8) μ m, abundant, forming a sterile band, hyaline, fusoid-ampullaceous, usually with short pedicels, some are sublageniform, with short necks 1.5-2.2 (-3.3) μ m diam., some are bifurcate.

Subhymenium cellular or subcellular, hyaline to brownish yellow, with the pigment irregularly distributed on the hyphal walls. Trama parallel, hyaline to yellowish or yellowish brown, the hyphae 11-16 (-22) μ m diam., thin or thick walled (up to 1.5 μ m). Epicutis formed by a hyaline, more or less gelatinized layer of parallel hyaline hyphae, 1.5-4 μ m diam. Hypodermium formed by elongated hyphae, 3-15 μ m diam., irregularly pigmented yellowish brown on the walls. Clamp connections more or less common.

HABITAT AND DISTRIBUTION. Solitary or gregarious in small groups on soil (never on dung) in meadows with short grasses (it seems to grow in rich soil where horses have pastures); sometimes growing in old corn plantations where horses have grazed; the grassy habitat is the most common, but sometimes growing close to the forest (Heim & Cailleux, 1959, reported *P. mexicana* growing inside of a pine forest in the Necaxa region; it is probable that the forest had clearings with grasses for the fungus to grow, such as a meadow). *P. mexicana* is very common in subtropical or deciduous forest regions, situated between 1000-1800 m elevation; very rarely in low places, found at 850-900 m (Chilapa, Los Tuxtlas and Cerro Pelón at Mije zone), 600 m (San José de Gracia) and 200 m (along a trail from Temascal to Huautla de Jiménez) (of these four localities the last two are situated in tropical lands, surrounded by rain forest). The forest surrounding the common temperate or subtropical localities at 1000-1800 m is a deciduous one formed by *Liquidambar styraciflua* and *Quercus* spp., with *Clethra*, *Alnus*, *Nyssa*, *Tilia* and other trees; while in the river valleys *Platanus lindeniana* is very common. *P. mexicana* is known only from Mexico and Guatemala. From this latter country Lowy (1977) reported it from Santa Elena Barillas, about 25 km South of Guatemala City (a subtropical locality).

STUDIED MATERIAL. MEXICO, State of Guerrero, 8 km Southeastern Chichihualco, Pascoe s.n. (Jul. 7, 1966) (ENCB). State of Michoacán, near Uruapan, road to Paracho, Ortiz (Sept. 12, 1978)* (ENCB). State of Morelos, Eastern Tepoztlán, near Camohmila, Salinas s.n. (Jul. 10, 1966) (ENCB); Vivar Flores s.n. (Jul. 10,

1966) (ENCB). 5 km West of Tepoztlán, high way to Cuernavaca, Guzmán 8095; 8098 (ENCB). State of Jalisco, Western Guadalajara, La Primavera zone, Rio Salado origen, Bancalari s.n. (Jun. 1961) (ENCB). State of Oaxaca, Huautla de Jiménez region, Wasson s.n. (Aug. 14, 1953) (PC, Type; ENCB, Isotype); Wasson 3 (NY); Wasson 5 (PC); Guzmán 1461 & 1904 (ENCB); Vargas 220 (ENCB), Ott s.n. (Jul. 15, 1975) (ENCB); near Rancho El Cura, Singer M-1502 & M-1521 (MICH); Guzmán 900 (ENCB). Jalapa de Díaz to Ayautla, Jacobs 37 & 60 (ENCB). San Juan Mazatlán (Mije zone), Lipp 16, 21 & 41-B (ENCB). Wasson s.n. (Jul. 1954) (PC as *Panaeolus fimicola*) (!). Amatepec (Mije zone), Jacobs 3 & 8 (ENCB). Near Santa Isabel, Cerro Pelón (Mije zone), Lipp 35 (ENCB). Coatlán (Mije zone), Wasson s.n. (Jul. 1954) (PC); Heim s.n. (Jul. 21, 1954) (PC); Heim s.n. (Jul. 1958) (PC); Cabrero & Hoogshagen s.n. (Jul. 1958, part) (PC as *P. hoogshagenii*). San Agustín Loxicha, Guzmán 1879 (ENCB); S of San Agustín Loxicha, Chilapa region, Guzmán 1133 (ENCB). Jalatengo to San Agustín Loxicha, Jacobs 18 (ENCB). Totontepec, Jacobs 14, 15; 61 (ENCB). San Juan Juquila (Distr. of Yautepec), Lipp 43; 44, 45 & 46 (ENCB). State of Puebla, Southeastern Necaxa, Rodríguez 72 (ENCB); Ursua s.n. (Sept. 1960) (ENCB); Guzmán 2060; 2115; 2122; 2420 (ENCB). State of Veracruz, Xalapa, Ventura 2283; 2289; 2318; 10168 (ENCB); López 63 (ENCB); Jacobs 67 (ENCB). Rancho Lucas Martín, Western Xalapa, Guzmán 389-B, 983 & 1874 (ENCB); 1169 (ENCB; LIL). Córdoba to Veracruz, near San José de Gracia, Guzmán 10146 (ENCB); Valenzuela 219 (ENCB). Near Misantla, Jacobs 29 & 32 (ENCB); Pollock 7-22-78-1 (ENCB); near Huatusco, Pollock 7-23-78-4 (ENCB) (this was culture at San Antonio, Texas, U.S.A., Pollock 5-14-78-1, ENCB). Municipio de Totutla, Encinar, Ventura 8407 (ENCB). Region of Los Tuxtlas, Volcan San Martín, East of Cerro Vaxin, Guzmán 10303 (ENCB).

DISCUSSION. *P. mexicana* is one of the most common hallucinogenic mushrooms in Mexico, and it is used by the Mexican Indians as a wondrous or divinatory mushroom in religious ceremonies of prehispanic origin. In Huautla de Jiménez region it is one of the most popular of hallucinogenic fungi and is known by the common mazatec name "nize" that means "pajarito" (= little bird).

It is closely related to *P. galindii* Guzmán, *P. acutipilea* (Speg.) Guzmán and *P. armandii* Guzmán & Pollock (see discussion of these). Heim (in Heim & Wasson, 1958) related *P. mexicana* to *P. squalidella* Peck and *P. graveolens* Peck, but the former belongs to the genus *Naematoloma* (Smith, 1951) and the latter is an independent species belonging to the Section *Zapotecorum*. The mycenoid form of *P. mexicana* is similar to *Panaeolus sphinctrinus* (Fr.) Quél. or *P. fimicola* (Fr.) Quél., but the black color from the gills and the grayish pileus easily separate one genus from the other. This similarity could explain the reason why Schultes (1939) reported *P. sphinctrinus* (as *P. campanulatus* var. *sphinctrinus* Fr.) as hallucinogenic mushroom in Huautla de Jiménez. Even Heim identified in 1954 one collection of *Psilocybe mexicana* from Coatlán as *Panaeolus fimicola* (Fr.) Quél., which the author observed in the PC Herbarium. The first collection of *P. mexicana* made by the author was in Rancho Lucas Martín (State of Veracruz) in 1955, but was first identified as a *Panaeolus* sp. *P. mexicana* is also similar macroscopically to *P. hoog-*

*Mr. E. Ortiz wrote a letter to the author showing new localities of *P. mexicana* in the State of Michoacán in Uruapan, Patzcuaro, Tingambato and Carapan zones, between 1490-2180 m of altitude.

shagenii Heim, but the microscopic features are completely different. Some collections of that fungus were confused with *P. mexicana* as was the case of *P. semperviva* Heim & Cailleux, a synonym of *P. hoogshagenii*. The collection by Cabrero & Hoggshagen of Jul. 1958 from Coatlán (in PC, identified by Heim as *P. hoogshagenii*) is mixed with *P. mexicana* and *P. hoogshagenii*.

The collections from the State Michoacán are new records of this species in Mexico. The collections from Misanla and Huatusco (both in the State of Veracruz) are also new records. Streser-Pean & Heim (1961) reported *P. mexicana* from Chiconquiaco, a locality near to Misanla. Guzmán (1978c) discussed several new records of *P. mexicana* in Mexico. The first record of *P. mexicana* was made by Heim (1956) who described this species in French from the State of Oaxaca (Mexico). More late Heim did not mention any type of *P. mexicana* in the original description (Heim, 1957), but Heim & Wasson (1958) (p. 133) the collection "Huatla de Jiménez, août 1953, Wasson" was designated the type, but in PC is only the collection "Wasson, Aug. 14, 1953" and in NY these are two collections: "Wasson 3, Aug. 14, 1953", and "Wasson 3, Aug. 13, 1953". It is consider the collection at PC the holotype (for a further discussion see Guzmán, 1978c).

Melendez-Howell (1967) presented a study of the spores of *P. mexicana* using electron microscopy. The chemistry and psychotropic effects of this species are fully discussed in Heim & Wasson (1958). The first chemical study of *P. mexicana* was made by Hofmann *et al.* (1958), where the isolation of psilocybin in crystalline form was demonstrated, as well as traces of psilocin. These two substances are the principal agents responsible for its hallucinogenic properties. Hofmann in the same year synthesized psilocybin in the laboratory. The first cultures of *P. mexicana* were made by Heim and Cailleux (see Heim & Cailleux, 1957; Heim & Wasson, 1958 and Heim *et al.*, 1967). The fruit bodies obtained had longer stipes, more narrower and higher pilei and a lot of variation in the form and color of all the fruit body. The microscopic features in all these fruit bodies did not show any variation in comparison the wild specimens as the author studied in several collections from PC. The seven taxonomic forms described by Heim & Cailleux (in Heim *et al.*, 1967) are merely synonyms of *P. mexicana* f. *mexicana*; they based the forms only in some cultural variations of the fruit bodies obtained. Moreover, these seven forms are *nomen nudum*, because they were only described in French.

The "mutant" form obtained from cultures of *P. mexicana* and described as *P. semperviva* Heim & Cailleux is a misidentification, because the cultures of *P. mexicana* were confused with some of *P. hoogshagenii* obtained by spores from a spore print in the field in Huautla de Jiménez, as was discussed in *P. hoogshagenii*. When Heim and Cailleux obtained fruit bodies from the mycelium that they believed to be *P. mexicana*, they described *P. semperviva* as a mutant. The study of the type of *P. semperviva* shows that this is actually *P. hoogshagenii*.

The formation of sclerotia was observed by Heim *et al.* (1958) from a culture of *P. mexicana*. In these sclerotia psilocybin and psilocybin were demonstrated. These sclerotia are subglobose, 10-30 mm diam., whitish to pale brownish, compact to very hard when dry. In the mycelia obtained through culture, Heim and Cailleux (in

Heim & Wasson, 1958) reported acremoniform forms in the hyphae, clamp connections and anastomoses and the formation of arthrospores were also observed. Singer (1958) and the author (1959) obtained cultures of *P. mexicana* through their explorations in the Huautla de Jiménez (Rancho El Cura) region. Ulloa and Herrera (1967) and Olmos-Fuentes & Herrera (1973) studied the factors affecting the growth of the mycelia of *P. mexicana* from Singer's cultures deposited in MEXU.

SELECTED ILLUSTRATIONS. Heim & Wasson (1958, pl. XIII; pl. XXI, fig. 1); Guzmán (1978, p. 112); Ott & Bigwood (1978, fig. 17); Heim *et al.* (1967, figs. 3-7).

64. *Psilocybe tampanensis* Guzmán & Pollock *Mycotaxon* 7: 373, 1978

Figs. 372-374, 671 & 760

Pileus about 24 mm in diam., convex to slightly umbilicate, then somewhat plane, glabrous, even, not striate at the margin, subviscid, hygrophanous, ochraceous brown to straw brown or yellowish gray; slightly bluish at the margin.

Lamellae adnexed, brownish to dark brown violet, with whitish edges.

Stipe about 50 × 2 mm equal but slightly thickened at the base, smooth, but subfloccose at the apex, yellowish brown to reddish brown, with whitish to caesious base.

Veil inconspicuous in the adults.

Context whitish to yellowish, thin, pliant, staining blue where cut. Odor and taste slightly farinaceous.

Spore print violaceous brown.

Spores (7.7-) 8.8-9.9 (-12) × (6-) 7-8.8 (-9.9) × 5.5-6.6 μ m, subrhomboid in face view, subellipsoid in side view, brownish yellow, with a thickened, a distinct germ pore, and a short appendage.

Basidia 14-22 × 8-10 μ m, 4-spored, hyaline, ventricose or subclaviform.

Pleurocystidia absent.

Cheilocystidia 16-22 × 4-9 μ m, lageniform, with more or less and flexuous long necks 2.2-3 μ m diameter, sometimes irregularly branches, hyaline, abundant, forming a sterile band.

Subhymenium seemingly subcellular with short elements, hyaline, but with yellow brown pigment irregularly incrustated on the walls. Trama regular, light brown to dark yellowish brown, with diffused pigment; hyphae up to 10 μ m diameter. Epicutis consisting a subgelatinized layer of parallel, thin (about 2 μ m wide), hyaline hyphae. Hypodermium formed by pigmented to hyaline hyphae; the elements are elongated to subglobose. Clamp connections present.

HABITAT AND DISTRIBUTION. Solitary on sandy soil in a meadow. Known only from the type locality. Fruiting in September.

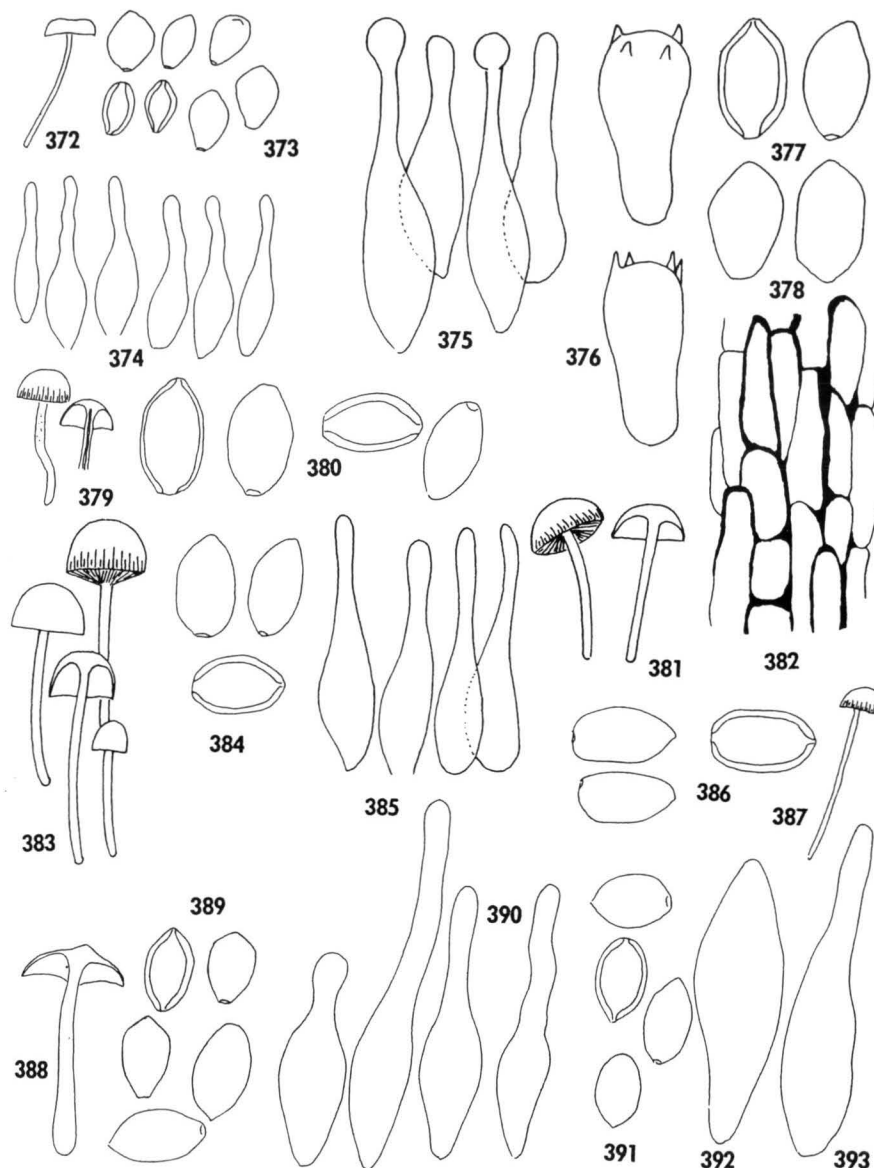
STUDIED MATERIAL. U.S.A., Florida, near Tampa, SE of Brendon, *Pollock* s.n., Sept. 3, 1977 (Type ENCB; Isotype NY).

DISCUSSION. *P. tampanensis* is close to *P. mexicana* Heim and *P. caerulescens* Murr., but differs from the former in the shape of the fruit body as well as in the size of the basidia, and from the latter in the size of spores and cheilocystidia. *P. mexicana* has a mycenoid habit and basidia $22-24 (-32) \times 7.7-11 \mu\text{m}$, and *P. caerulescens* has a collybioid habitat and spores $(6-) 6.7-8 (-8.5) \times 5.2-6.5 \times 3.3-5.2 \mu\text{m}$ and cheilocystidia $15-22 \times (3-) 4.4-5.5 \mu\text{m}$, as the author observed in both types (PC and NY, respectively). *P. tampanensis* seems to be an intermediate subtropical species, between *P. caerulescens* and *P. mexicana*. *P. caerulescens* occurs from Alabama (U.S.A.) to Venezuela and *P. mexicana* is distributed from Mexico to Guatemala; both fungi are hallucinogenic and are found in meadows or open places of the deciduous or subtropical forests. Because of its strong relationships with the mentioned hallucinogenic species, *P. tampanensis* very probable contains psilocybin.

Cultures of *P. tampanensis* were made by Pollock (see Guzmán & Pollock, 1978), from a spore print from the type. The fruit bodies did not attain full size during their development and usually failed to sporulate. Pileus small (less than 10 mm in diam.); stipe thin (1-2 mm in diam.), usually very short (less than 35 mm in length) or sometimes elongated (up to 113 mm in length). *P. tampanensis* is strongly heliotropic as is *P. mexicana* and *P. caerulescens*. Fruit bodies were also obtained in a greenhouse; these were robust and sporulated copiously. The pileus sometimes reached 38 mm in diam.; stipe thick (often 4-5 mm wide) and reaching up to 60 mm in length. Carpophores tend to grow in large cluster on the casing soil. Pollock obtained fruit bodies in a grassy area of his garden, where mycelia from the cultures in the greenhouse were introduced; these fruit bodies are normal in macroscopic and microscopic features. All the fruit bodies obtained through the cultures are deposited in ENCB. They were collected in San Antonio, Texas (U.S.A.). Production of sclerotia in cultivation was observed in *P. tampanensis*, as Heim & Cailleux (1957) and Heim *et al.* (1958) reported in *P. mexicana*. It is interesting to observe that *P. caerulescens* produces sclerotia in wild conditions as the author (1978c) recently reported. It is also interesting to note that in *Psilocybe*, sclerotia have only been reported in these three species.

The name of the species refers to the locality where the type was collected.

Plate 28: Figs. 372-393. - Several species of *Psilocybe*. 372-374: *P. tampanensis*, 372: Carpophore, 373: Spores, 374: Cheilocystidia (all from the type). 375-382: *P. argentina*, 375: Cheilocystidia, 376: Basidia, 377-378: Spores, 379: Carpophore, 380: Spores, 381: Carpophores, 382: Trama - (375-377 & 381-382: Ventura 5735; 379-380: type). 383-387: *P. coprophila*, 383: Carpophores, 384: Spores, 385: Cheilocystidia, 386: Spores, 387: Carpophore (383-385: Guzmán - 908; 386-387: type of *P. pratervisa*). 388-390: *P. fuegiana*, 388: Carpophore, 389: Spores, 390: Cheilocystidia (all - from the type). 391-393: *P. subbrevipiles*, 391: Spores, 392: Pleurocystidia, 393: Cheilocystidia (all from the type).



Section Stuntziae Guzmán, sect. nov.

oris subrhomboides, crassi tunicatis. Pleurocystidiis vel adsum vel absunt. Cum annulus. Typus: *stuntzii* Guzmán.

ores subrhomboid, thick walled (more or less 1 μm thick). Pleurocystidia present absent. Annulus present. Habitat variably, soil, rich soil, dung, and rotting wood. Known from Northwest North America, South America and Eastern and Southern Asia. All the species of this Section turn blue when cut and probably they are hallucinogenic.

Species considered in this Section: 65. *P. caeruleoannulata* Sing. ex Guzmán, 66. *P. stuntzii* Guzmán & Ott, 67. *P. subaeruginascens* Höhnelt var. *subaeruginascens*, 68. *subaeruginascens* var. *septentrionalis* Guzmán, and 69. *P. uruguayensis* Sing. ex Guzmán.

Key to species

- Pleurocystidia present. Species known only from Japan and Java. 2
- Pleurocystidia absent. 3
- Spores (7.7-) 8.8-10 (-12) μm long. Pleurocystidia (19-) 22-30 (-33) μm long. Cheilocystidia (16-) 18-23 (-33) μm long. Common in Java and in subtropical and tropical regions of Japan. 67. *P. subaeruginascens* var. *subaeruginascens*
- Spores (4.9-) 6-9.9 (-12) μm long. Pleurocystidia 19-23 μm long. Cheilocystidia 16-25 μm long. Only known from Northern Japan. 66. *P. subaeruginascens* var. *septentrionalis*
- Cheilocystidia small, 17-20 μm long. Species known from Brazil and Uruguay. 65. *P. caeruleoannulata*
- Cheilocystidia larger than 20 μm long. 4
- Cheilocystidia 24.5-32 $\times$ 4.5-9 μm , somewhat pedicellate and sometimes branched. On horse dung. Known only from Uruguay. 69. *P. uruguayensis*
- Cheilocystidia 22-30 $\times$ 4.4-6.6 μm , not pedicellate nor rarely branched. On soil, rarely on rich soil. Known only from the Northwest North America. 66. *P. stuntzii*

Psilocybe caeruleoannulata Sing. ex Guzmán *Mycotaxon* 7: 235, 1978.

Figs. 203-208

Stropharia siccipes Karst. var. *lugubris* Rick, *Lilloa* 4: 83, 1939.

Stipe (5-) 10-20 (-25) mm in diam., conic to frequently short papillate, glabrous, even to transparently striate at the margin when moist, viscid, pellicle separable,

hygrophanous, reddish brown fading to sordid pallid chamois with brownish buff to alutaceous center but remaining straw color all over.

Lamellae sinuate or adnate or adnexed, grayish violet but with whitish edges when young.

Stipe (15-) 25-45 $\times$ 1-2 mm, equal but slightly and gradually tapering upwards, whitish from a silky appressed covering over a gray background, becoming grayish cinereous where touched; soon caesious at base.

Veil well formed as a white thin membrane, forming an annulus membranous but thin, smooth below to somewhat striate above, white, slightly staining blue, fragile but usually persistent.

Context pallid in pileus, grayish to brownish in stipe; odor and taste slightly farinaceous. Weakly bluing when cut.

Spore print deep violaceous.

Spores (7.7-) 9.9-11 (-12) $\times$ 6-6.6 (-7.1) $\times$ 5.5-6 μm , subrhomboid in face view, subellipsoid in side view, yellowish brown, thick walled and with a broad truncate germ pore.

Basidia 15-22.4 $\times$ 7.5-9.8 μm , 4-spored, hyaline, clavate to ventricose.

Pleurocystidia absent.

Cheilocystidia 17-20 $\times$ 5-6 μm , forming a sterile band, hyaline, lageniform or vesiculose-ventricose, with short or long filamentous neck 5-8.5 $\times$ 1-2 μm , sometimes with an viscous hyaline drop at the apex.

Subhymenium with parallel, brownish, thin up to 4 μm diam. hyphae. Trama regular, brownish or hyaline, with chestnut incrustated hyphae, 12-30 μm diam., thin walled. Hypodermium with interwoven elongated brownish hyphae which are broader on the average than those of the epicutis, but in the context often more pigmented and darker, more irregular and with quite a few rather short elements. Epicutis formed by a thin hyaline layer of 50-60 μm thick strongly gelatinized, with filamentous hyaline hyphae, 0.5-2.2 μm thick. Clamp connections present.

HABITAT AND DISTRIBUTION. On marshy ground or in grasslands outside the forests or *Araucaria* and *Podocarpus*, on soil in meadows or sometimes on rotting wood or dung. Known from Brazil and Uruguay. Fruiting in March-May.

STUDIED MATERIAL. BRAZIL, Sao Salvador, Rick 9357 (PACA 20919 as *Stropharia subcyanescens*). State of Sao Paulo, near Campos de Jardo, Parque Forestal, near Rio Sayucaiguasu, Guzmán 8877 & 8916 (ENCB; SP). Santa Maria, Rick (1936) (PACA 15234, Type of *Stropharia siccipes* var. *lugubris* Rick). Sao Leopold, Rick 9362 (PACA, 15229, as *Stropharia inuncta*). Without locality, Rick (Herb. Bresadola 287; NY, as *Stropharia luteonitens*).

URUGUAY, Maldonado, Singer B-4172 (BAFC type).

DISCUSSION. This species is somewhat close to *P. marthae* Sing. because of its small

cheilocystidia, but that species has no annulus, and it is not bluing. *P. marthae* is only known from Chile. This species was named by Singer in the herbarium BAFC based on the collection from Uruguay. Later the author of the present monograph collected the same fungus in Brazil and also found the species in the herbarium PACA as *Stropharia siccipes* Karst. var. *lugubris* Rick, a variety described in 1939 but not considered in Rick's later papers (1961). This Rick's material agrees well with the type of *P. caeruleoannulata*; thus the variety of Rick is considered synonym. Bresadola confused *P. caeruleoannulata* with *P. luteonitens* (Vahl ex Fr.) Parker-Rhodes, as the author noted in one of Rick's collections (NY), identified by Bresadola as *P. luteonites*, but this species has spores $15.4-18.7$ (-20) $\times$ $11-13.2$ $\times$ $9.9-11$ μm .

The name of the species refers to the bluing annulus.

66. *Psilocybe stuntzii* Guzmán & Ott *Mycologia* 68: 1261, 1976.

Figs. 209-214, 677, 680, 725; 727-728 & Plate 7

P. pugetensis Harris, *Growing wild mushrooms*, p. 77, 1976, nom. nud.

Pileus (5-) 10-20 (-35) μm in diam., conic to convex, then campanulate or subumbonate, frequently subpapillate, becoming shallowly depressed at the disc or plane in the old specimens, glabrous, but with traces of silky white veil at the margin in young stages, even to slightly translucent striate at the margin when moist, viscid to lubricous, with cuticle removable, hygrophanous, dark reddish brown or orangish brown to olivaceous brown or fulvous brown, fading out to ochraceous or pale ochre tone, staining slightly greenish-blue when injured or with the age.

Lamellae adnate or sinuate or adnexed, yellowish brown at first, soon violet brown or chocolate brown to blackish violet, uniform or somewhat mottled, with whitish edges.

Stipe (20-) 35-65 (-75) $\times$ (1.5-) 2-4 (-6) mm, equal or slightly enlarged at the base, cylindric or subcylindric, twisted striate at times, flexuous, glabrous to slightly fibrillose, dry, stuffed with white mycelium to hollow, white or whitish silky to ochraceous or brownish fibrillose; easily staining blue-green when injured or touched, mainly on the base, which finally becomes blackish.

Veil as a white, thin membrane forming an annulus, fragile and persistent, rarely absent (Plate 7), thin, white, smooth below but slightly striate above, with subgelatinous margin; easily bluing along the margin.

Context whitish or light to dark yellowish-brown, translucent to somewhat pliant in the pileus, tough in the stipe, staining blue when cut mainly in young stages. Odor and taste strong farinaceous in young stages, but weak in the adults. KOH staining the pileus and context reddish brown, negative or rose on the stipe or in young specimens.

Spore print deep violaceous to dark violaceous purple.

Spores (8.2-) 9.3-10.4 (-13.5) $\times$ 6-7.1 (-7.7) $\times$ 5.5-6.6 μm , subrhomboid in face view, subellipsoid in side view, with a hilar appendage visible and a truncate apex with a broad germ pore, thick walled, dingy yellow brown.

Basidia 16.5-33 $\times$ 5.5-8.8 μm , 4-spored, hyaline, sterigmata 3-4.4 μm long, subcylindric, with the median region slightly constricted.

Pleurocystidia absent.

Cheilocystidia 22-30 $\times$ 4.4-6.6 μm , abundant, forming a sterile band, hyaline, lageniform, fusiform-lanceolate or fusoid-ampullaceous, with an elongate and flexuous neck, 1-2.2 μm in diameter, sometimes irregularly branched.

Subhymenium seemingly not cellular, with yellowish brown, hyphae with pigment irregularly incrustated and distributed on the hyphae walls. Trama regular with hyaline elongate cylindric or subglobose hyphae cells. Epicutis consisting of a thick pellicle with filamentous hyphae, moderately to strongly gelatinized, hyaline or yellowish, 1.6-5 μm in diameter. Hypodermium of compact subglobose hyphae, 5-10 μm diam., hyaline or more or less colored brownish to brownish red. The hyphae of the annulus hyaline, parallel to the surface, some gelatinized, 2-9 μm diam. Yellow brown lactiferous hyphae 2-5 μm diam. present in the hypodermium. Clamp connections present on all the hyphae.

HABITAT AND DISTRIBUTION. Scattered to gregarious in dense clusters, rarely solitary, on soil or on small plant fragments such as bark residues, or on bark mulch of conifers, or on well decomposed manure, in grasses, gardens or lawns in the cities, rarely in grassland or meadows. Fruiting from August to December. Only known from the Northwest North America, from Vancouver (Canada) to California (U.S.A.), but especially common in Washington and Oregon states.

STUDIED MATERIAL. CANADA, Vancouver city, Guzmán 16621; 16625 & 16626 (all in ENCB except 16626 also in NY). Vancouver Island, Haard & Pollock s.n. (10-28-75) (ENCB).

U.S.A., Washington, Seattle, University of Washington Campus, Stuntz s.n. (Aut. 1973) (WTU Type); Stuntz s.n. (11-5-72) (WTU); Guzmán 16613 (ENCB); Stamets s.n. (Aut. 1975) (ENCB); Jones s.n. (Oct. 8, 1973) (WTU); Haard & Pollock s.n. (10-28-75) (ENCB); Gorham s.n. (5-XI-72) (WTU 17623). Lewis Co., near Randle, Leslie 2709 (ENCB); Pollock s.n. (10-26-75) (ENCB); Gerrish s.n. (Nov. 1975) (ENCB). Seattle, Benedict & Brady 1961 (part) (MICH; ENCB); Benedict & Brady 1962 (part) (MICH, ENCB). Olympia, Capitol Lake, Leslie 2730 & 3908 (ENCB); Ott 75-14 & 75-15 (ENCB). Evergreen State College Campus, Guzmán 16595 (ENCB); Bigwood 07, 08, 12, 13, 15 & 16 (ENCB). Near Millersylvania Park, Maytown Tilly Rd., Ott 75-8 & 75-9 (ENCB). Tumwater, Bigwood 09 (ENCB); Ott 01 (ENCB). North of Bellinghame, Guzmán 16614, 16615 & 16616 (ENCB). Oregon, near Sitcoos Station, Menser 872 (ENCB), Guzmán 16649, 16650, 16652, 16659 & 16662 (all in ENCB). Lane, Leslie 3779 & 3932 (ENCB). Tjard, Leslie 3996; 3997 (ENCB). California, San Francisco, Ott 75-21 (ENCB).

DISCUSSION. This species is very close to *P. uruguayensis* Sing. ex Guzmán, but it seems different in the cheilocystidia, somewhat larger in that species and frequently pedicellate and branched. *P. uruguayensis* is known only on dung from Uruguay, and does not turn blue conspicuously as does *P. stuntzii*. But there is a field grass-land form of *P. stuntzii* that is more thinner, scarcely bluing and frequently lacks an annulus. It seems to be an intermediate form between the type North American form and South American species. It is probable that *P. uruguayensis* is merely an ecological form of *P. stuntzii*, but before this be proven, it is necessary to study more fresh material of the Uruguayan fungus.

P. stuntzii is a common hallucinogenic species in the Northwest North America. Many popular books on hallucinogenic fungi from the U.S.A. (Harris, 1976; Haard & Haard, 1977; Menser, 1977; Miller & Tatelman, 1977 and Ott & Bigwood, 1978) show color or black & white plates of this species. Harris (*op cit.*) used the binomial "*Psilocybe pugetensis*" but it is not a valid name.

A chemical report of *P. stuntzii* is found in Guzmán & Ott (1976). The material used by Benedict *et al.* (1962) for the chemical analysis of *P. cyanescens* is unfortunately a mixture of *P. cyanescens* and *P. stuntzii*. The author checked the specimen, kindly sent by Brady to Pollock in 1976 and now deposited in ENCB and marked as Benedict & Brady 1961 (part) and 1962 (part) in the above studied material of *P. stuntzii* as well as in *P. cyanescens*. They were collected in Hager's House lawn in Seattle, and botanical specimens were deposited by Smith in MICH as *P. cyanescens*. It is interesting to observe that after the description of this species (Guzmán & Ott, 1976) and the illustrations in the above mentioned popular books, *P. stuntzii* was intensely looked and it is now difficult to find it in the type locality (where it was very abundant before 1976).

This species is named for Dr. Daniel E. Stuntz, in recognition of his valuable work on Agaricales and who also collected the type.

SELECTED ILLUSTRATIONS. Menser (1977, fig. 24); Ott & Bigwood (1978, fig. 11); Stamets (1978, figs. 27-29).

67. *Psilocybe subaeruginascens* Höhnelt *Sitzungsber. Kaiserl. Akad. Wissen. Wien* 123(1): 78, 1914, var. *subaeruginascens* Figs. 215-223

Stropharia aerugineomaculans Höhnelt, *Sitzungsber. Kaiserl. Akad. Wissen. Wien* 123(1): 78, 1914.
Psilocybe aerugineomaculans (Höhnelt) Sing. & Smith, *Mycologia* 50: 273, 1958.
(No synonym with *Stropharia venenata* Imai, = *Psilocybe venenata* (Imai) Imaz. & Hongo).

Pileus (10-) 15-25 (-58) mm in diam., conic to convex or campanulate, or subumbonate, rarely umbonate, becoming plane-convex, expanded or subdepressed, glabrous, even, but margin slightly striate when moist, subviscid to lubricous or when wet slimy, hygrophanous, orangish brown, olive brown, grayish green or brownish, turning or fading to ochraceous, dull yellow orange, brownish yellow or straw color. Staining dark blue or greenish blue when handled or bruised.

Lamellae broadly adnate to adnexed, or somewhat subdecurrent, some crowded, pink, grayish brownish or yellow brown to dark brown, concolorous or slightly mottle, edges even and concolorous. Frequently turning blue or greenish when bruised. Sometimes dichotomously forked gills are observed.

Stipe 30-40 (-60) $\times$ 1.5-3 (-9) μ m, equal or slightly thickened at the base, hollow or stuffed with loose white to wooly pith; surface flocculose to glabrescent, fibrillose, white to concolorous with pileus, weakly staining blue when touched or rubbed. Sometimes with short rhizomorph-like mycelium at the base, that also stains blue.

Veil well developed, as a thin white membrane that forming a persistent annulus, membranous, and bluing when touched, sometimes evanescent.

Context of the pileus fleshy, white to concolorous with the surface; and white or whitish to ochraceous or brownish and tough or cartilaginous in the stipe. Bluing when cut. Odor and taste slightly farinaceous. KOH stains the pileus and stipe dark brown.

Spore print deep brown, brownish-violet or blackish-violet.

Spores (7.7-) 8.8-10 (-12) (-13 very rare) $\times$ 6.6-7.7 (-8.5) $\times$ 5-6.6 μ m, rhomboid or subrhomboid in face view, subellipsoid in side view, thick walled, yellowish brown, with a broad and plane germ pore. Sometimes abnormal spores are present, with two germ pore or with a median constriction.

Basidia 18-25 (-29) $\times$ 6-9 (-10) μ m, 4-spored, rarely 1-, 2- or 3-spores, hyaline, sterigmata conic, 5-6 $\times$ 2-3 μ m, ventricose subpyriform, with a slight median constriction.

Pleurocystidia (19-) 22-30 (-33) $\times$ (5-) 6-8 (-14) μ m, hyaline, broadly fusoid-ventricose with an obtuse apex, 2.2-3.3 μ m broad.

Cheilocystidia (16-) 18-23 (-33) $\times$ (4.4-) 5.5-9 μ m, abundant, forming a more or less sterile band, hyaline, fusoid-ventricose or sublageniform, with a more or less short or long neck, 2.5-4 μ m broad, frequently with a hyaline mucilaginous substance at the apex and sometimes the whole gill edge gelatinized.

Subhymenium with brownish pigmented parallel hyphae, irregularly incrustated. Tramal hyphae parallel, brownish to hyaline without incrustating pigment, thin walled. Epicutis subgelatinized, formed by a hyaline thin layer of more or less parallel hyphae, up to about 4 μ m diam. Hypodermium brownish to hyaline, more or less subcellular or with elongated and parallel, thin walled hyphae. Clamp connections present.

HABITAT AND DISTRIBUTION. Scattered to gregarious or caespitose on different kinds of substratum: soil, humus, rotten wood, bark, chips, burned ground, or dung, but seems more frequent on rotten wood and horse dung; common on trails on roadsides in deciduous (or subtropical) forests. Fruiting April to July, but seems common in May (at least in Japan). Known only from Souther Japan to Java.

STUDIED MATERIAL. JAPAN, Kitakanbara-gun, Satokawa-mura, *Yokoyama 2775* (Hongo Herb.; ENCB). Niigata, Muramatsu-machi, *Matsuda 352* (BAFC as *P.*

aerugineomaculans). Kyoto, Kameoka, *Hongo 2249* (Hongo Herb., as *P. venenata*). Sakyo Ku, Shimogamo Shrine, *Yokoyama 711* (Hongo Herb. & ENCB). Keihohu Cho, Seryo, *Yokoyama 1647 & 2297* (Hongo Herb. & ENCB). Shiga, Ibuki Cho, Kozubara, *Yokoyama 1991* (Hongo Herb. & ENCB). Mt. Itili, *Hongo 658* (Hongo Herb., as *P. venenata*). Tottori, Daisen National Park, Kawadoko, *Hongo & Yokoyama 2146* (Hongo Herb. & ENCB); *Hongo et al. EN-Ps-7* (Herb. Tottori). Otsu, Hiratsum Cho, Ishiyama, *Hongo 1620; 1768* (Hongo Herb., as *P. venenata*). Kokoge, Tottori-city, *Nagasawa EN-Ps-8, EN-Ps-9, EN-Ps-16 & EN-Ps-17* (Tottori Herb., as *P. venenata*).

JAVA (INDONESIA), Bogor (= Buitenzorg) (South of Diakarta), *Höhnelt B-1771* (FH Type); *Höhnelt* s.n. (FH Type of *P. aerugineomaculans*).

DISCUSSION. The synonymy with *P. aerugineomaculans* (Höhnelt). Sing. & Smith is based on a study of both types, as well as on several Japanese collections. Singer & Smith (1958b) separated *P. subaeruginascens* from *P. aerugineomaculans* only on the surface of the pileus, "merely moist" in the first and viscid in the second. They reported the epicutis in *P. subaeruginascens* as not gelatinous, while in *P. aerugineomaculans* this layer is gelatinized. However the study of the pileal epicutis in the type of *P. subaeruginascens* shows that the hyphae are indeed subgelatinized. Considering that the other microscopic features such as spores, pleurocystidia and cheilocystidia are the same in both species, and considering that in many fungi the viscid feature of the pileus changes with the age of the carpophores, viscid in young stages to subviscid or merely lubricous in old specimens, it is considered that *P. aerugineomaculans* is a synonym of *P. subaeruginascens*. Another feature separating *P. subaeruginascens* and *P. aeruginomaculans* followed by Singer & Smith (1958d) is the habitat; the first growing on dung and the second on wood, but from a study on several collections by this author, this difference in the habitat seems to have no taxonomic value. The Japanese material was found in different kinds of substrata as other species such as *P. stuntzii*, *P. yungensis*, *P. caeruleoannulata*, *P. caeruleascens* and others that show wide variations in the habitat.

Stropharia venenata Imai (= *S. caeruleascens* Imai) considered as synonym of *Psilocybe subaeruginascens* by Singer & Smith (1958b) is an independent species, based on the study of the type. It belongs to Section *Semilanceatae*, as will be discuss. Imazeki and Hongo (in Hongo, 1957) considered Imai's species in the genus *Psilocybe* as an independent species. They did not present any discussion or description of any material, but all the specimens from Hongo Herb. studied by the author, which were kindly sent to him by Dr. Hongo, belong to *P. subaeruginascens*. They have subrhomboid spores and pleurocystidia, and the type of *Stropharia venenata* Imai has ellipsoid spores, and no pleurocystidia.

It is very probable that *P. subaeruginascens* has a wide distribution throughout Indonesia, but more explorations are necessary. Bogor, the type locality (was named Buitenzorg) is a tropical region situated on Java Island, to the South of the Harbor of Djakarta, at 260 m elevation and has 4250 mm of rain and an average monthly temperature 30-32°C. On the other hand, the localities from Japan are more temperate and dry and belong to the subtropical region. Overeem-de Hass (1920),

based on Höhnelt's report, registered *P. subaeruginascens* and *Stropharia aeruginomaculans* from Java.

The name of the species refers to the blue-greenish color of the pileus and stipe.

SELECTED ILLUSTRATIONS. Imazeki & Hongo (1971, pl. 26, fig. 148, as *P. venenata*).

68. *Psilocybe subaeruginascens* Höhnelt var. *septentrionalis* Guzmán, var. nov. Figs. 352-354 & 740

A var. typus differt sporis (4.9-) 6-9.9 (-12) × 5.5-6.6 × 4.5-5.5 μm, pleurocystidiis 19-23 × 8.8-9.9 μm et cheilocystidiis 16-25 × 5.5-7.5 μm. Ad rammenta pinus, Kuromatsunai, Hokkaido (Japan), Typus: Yokoyama 1844 (Hongo Herb.).

The macroscopic features are as the type variety.

Spores (4.9-) 6-9.9 (-12) × 5.5-6.6 × 4.5-5.5 μm, subrhomboid, thick walled, yellowish brown, with a broad germ pore. Frequently abnormal spores are present, heart shaped, with two germ pore or some with a middle strangulation.

Pleurocystidia 19-23 × 8.8-9.9 μm, hyaline, not very abundant, fusoid-ventricose with a short neck, sometimes with a narrow base.

Cheilocystidia 16-25 × 5.5-7.5 μm, abundant, hyaline, fusoid-ventricose, with short to more or less flexuous long neck, 2.2-4.4 μm broad.

Other microscopic features are as the type variety.

HABITAT AND DISTRIBUTION. Scattered on heaps of conifer chips. Fruiting in May. Known only from the type locality (North of Japan).

STUDIED MATERIAL. JAPAN, Hokkaido, Kuromatsunai, *Yokoyama 1844* (Hongo Herb. Type).

DISCUSSION. The smaller spores, pleurocystidia and cheilocystidia separate this variety from the type. Maybe this is an independent species, but as the author has studied only one collection and that in dried condition, he prefers to consider it for the moment as a variety of *P. subaeruginascens* Höhnelt. Anyhow if it is another species, it is very close to Höhnelt's species.

The name of the variety refers to the northern temperate locality which that differs from the tropical or subtropical southern locality of the type variety.

69. *Psilocybe uruguayensis* Sing. ex Guzmán *Mycotaxon* 7: 250, 1978.

Figs. 224C-228

Pileus 10-30 mm in diam., convex to more or less plane or slightly depressed in old specimens, glabrous, even, subviscid, seemingly hygrophanous, reddish-brown or brown to yellow brownish.

Lamellae adnate to somewhat sinuate, brownish to violaceous-brown, edges concolorous.

Stipe 40-55 × 2-3 mm, equal, not bulbous, smooth, whitish above to brownish or concolorous with pileus below.

Annulus membranous, whitish, thin and permanent.

Context whitish. Odor and taste unknown.

Spores (7.5-) 8.8-11.3 (-12.7) × 7-8 (-9) × 5-7 μm, subrhomboid in face view, subellipsoid in side view, with a thickened yellowish brown wall and with truncated apex because of a flattened germ pore.

Basidia 25-30 × 7.5-9.5 μm, including sterigmata which are 4-6 μm long, 4-spored, hyaline, subcylindric or vesiculose.

Pleurocystidia absent.

Cheilocystidia 24.5-32 × 4.5-9 μm, hyaline, abundant, forming a sterile band, ventricose-elongated, somewhat pedicellate, but with a long neck which is 1.5-2 μm in diam, sometimes branched in old specimens.

Subhymenium seemingly subcellular with short elements, pale yellowish brown, without incrustated pigment at least no conspicuous. Trama regular, same color as the subhymenium or hyaline, with elongated to inflated hyphae up to 35 μm broad. Epicutis with a thick layer of gelatinous hyaline hyphae, parallel to the surface. Clamp connections present.

HABITAT AND DISTRIBUTION. Gregarious on horse dung, known only from the type locality. Fruiting in April.

STUDIED MATERIAL. URUGUAY, Montevideo, Parque Nacional Carrasco, *García Zorrón* s.n. (3-IV-1960) (*Singer* 2439) (Type BAFC; Isotype in MICH and ENCB).

DISCUSSION. This species is poorly known taxonomically; probably turns blue slightly in all the parts because of its very close relation to *P. stuntzii* Guzmán & Ott and other species of the Section. Only future collections of this species will shed light to its correct status (see discussion of *P. stuntzii* Guzmán & Ott). Singer, in his notes, says that the species is close to "the group *aeruginascens*, *venenata*, *subaeruginascens*, and has the same size, spore print, color and habitat".

Section Coprophilae Guzmán, sect. nov.

Sporis subhexagonoideus, crassi-tunicatis. Carpophoris non caerulescentibus. Species fimetariis sine annulus. Typus: *P. conprophila* (Bull. ex Fr.) Kumm.

Spores subhexagonal, thick walled (more or less 1 μm thick). Pleurocystidia present or absent. Without annulus. Generally fimicolous species (only one species on rich soil).

Species considered in this section are: 70. *P. argentina* (Speg.) Sing., 71. *P. coprophila* (Bull. ex Fr.) Kumm., 72. *P. fuegiana* (Horak) Sing., 73. *P. panaeoliformis* Murr., 74. *P. subbrevis* Smith & Hesler.

Key to the species

- 1a. With pleurocystidia, different in form to from cheilocystidia. Growing on rich soil. Known only from the Southeastern U.S.A. Spores (9-) 10-13.6 (-14.5) μm long. 74. *P. subbrevis*
- 1b. Without pleurocystidia, or if present, scarce and like the cheilocystidia. Growing mainly on dung. 2
- 2a. Spores (8-) 9.9-11.5 (-12) μm long. 3
- 2b. Spores larger than above. 4
- 3a. Cheilocystidia 12-20 μm long. Species common in subtropical regions. *P. panaeoliformis*
- 3b. Cheilocystidia 18-30 (-32) μm long. Species known only from temperate austral (Southern Argentina) or boreal (Michigan, U.S.A.) regions. ... 72. *P. fuegiana*
- 4a. Spores (9-)10-12 (-14) μm long. Species very common in tropical and subtropical regions, rare in temperate zones. 71. *P. coprophila*
- 4b. Spores (11-) 12-15 (-17) (-18.6). Species common in temperate regions, or in high mountains, in boreal and austral regions. 70. *P. argentina*

70. *Psilocybe argentina* (Speg.) Singer *Beih. Nov. Hedwigia* 29: 241, 1969.

Figs. 375, 382, 404-405 & 685-686

Deconica argentina Speg., *Ann. Mus. Nac. Buenos Aires* 6: 152, 1899.

Psilocybe merdicola Huijsm., *Persoonia* 2: 93, 1961.

Pileus (8-) 12-20 (-25) mm in diam., semiglobose to convex, rarely subumbonate, glabrous, even to slightly striate at the margin when moist, subviscid to lubricous, frequently slightly shining when dry, hygrophanous, reddish-brown or chestnut brown, fading to brownish yellowish or straw dark color.

Lamellae broadly adnate, fuscous-gray to dull buff or dark violaceous brown, with whitish edges. Frequently mottled.

Stipe (15-) 20-45 (-50) × (1.3-) 2-3 mm, equal or eventually somewhat thickened at the apex, smooth or slightly fibrillose, hollow, surface whitish to almost concolorous with the pileus or more reddish-brown.

Veil an arachnoid white mass in young stages, but stipe without any annulus or remains from the veil in the adults.

Context paler than the pileus to almost concolorous, unchanged in color exposed to the air. Odor and taste slightly fungoid.

Spore print dark violaceous brown or dark purple brown.

Spores (11-) 12-15 (-17) (-18.6) × (9-) 9.6-10.2 (-12) × 7-8.5 μm, strongly subhexagonal or subrhomboid in face view, subellipsoid in side view, thick walled, light to dark yellowish brown, with broad truncate germ pore.

Basidia 24-32 × 10-13 μm, 4-spored, hyaline, ventricose subpyriform, sometimes with a slight medial constriction.

Pleurocystidia absent.

Cheilocystidia 22-45 × 4.5-10 μm, abundant, hyaline, thin walled, fusoid-ventricose or sublageniform to lageniform, with long neck 3-8 μm broad and with obtuse, subglobose to globose apex.

Subhymenium subcellular, with short globose elements strongly incrusting on the thick walls with orangish-brown pigment. Trama parallel, brownish to hyaline, thick walled hyphae, 4.8-10 μm diam. Epicutis as a narrow sparsely gelatinized layer with hyaline thin hyphae. Hypodermium subcellular, incrusting like the subhymenium, hyphae up to 20 μm diam. Clamp connections present.

HABITAT AND DISTRIBUTION. Gregarious on cow and horse dung, in grassland, meadows, or outside of the wooded areas, both in shaded or sunny places. Fruiting almost all the year, but mainly during in the rainy season. Known in America (except in Canada, Alaska and Greenland) but mainly growing from South America to Mexico, but in more temperate regions such, as the austral lands or the high mountains. Known from the "paramos" of Venezuela and Colombia, at 3200-3400 m elevation, in grassland with *Espeletia*. Rare in U.S.A., where it is known only from Pacific Coast and Michigan. It seems rare in Europe where it grows only in the north or in the alpine zone of the central part.

STUDIED MATERIAL. U.S.A., California, Long Beach, *Pollock 108* (ENCB). Michigan, Shavra, Hollow, *Smith 6209* (MICH as *P. merdaria*). Washington, Kittitan, Cascade Mount, *Stuntz* s.n. (Oct. 1, 1951) (WTU 6364).

MEXICO, Coahuila, Municipio de Arteaga, La Siberia, *Guzmán 11247* (ENCB; NY). Distrito Federal, Cuajimalpa, *Alvarez* s.n. (Aug. 5, 1962) (ENCB). Pedregal de San Angel, Cerro Xitle, *Rzedowski* s.n. (Jun. 16, 1952) (ENCB). Hidalgo, South-eastern Huasca, *Guzmán 10892* (ENCB). Morelos, Lagunas de Zempoala, *Guzmán*

5720 (ENCB). Nuevo León, Cerro del Potosí, *Guzmán 11187* (ENCB). State of Mexico, Parque Nacional Miguel Hidalgo, La Marquesa, *González 3* (ENCB); *Galván 81* (ENCB). Southeast of San Pedro Nexapa (Popocatepetl zone), *Nava 4* (ENCB). Paso de Cortés (Popocatepetl-Iztaccihuatl), *Guzmán 1675* (ENCB). Nevado de Toluca, *Guzmán 5365* (ENCB). State of Veracruz, near Perote, *Ventura 4428 & 5735* (ENCB).

COLOMBIA, Dept. Boyacá, road Aquitania and the crossing of Sogomoto to Aguazul, *Dumont CO-4951* (NY). Road Chocontc to Aguacalera, *Dumont CO-4600* (NY). Dept. Chocó, near Ansermanuevo, road to San José del Palmar, *Dumont CO-7451* (NY).

VENEZUELA, Parque Nacional Sierra Nevada, Teleferico de Mérida, Station La Aguada, *Guzmán 9245* (MER; ENCB).

BRAZIL, San Salvador, *Rick 9321* (PACA 20095 as *P. merdaria*). Sao Leopold, *Rick 9324* (PACA 14552 as *P. merdaria*).

ARGENTINA, La Plata, *Spegazzini* s.n. (10-V-1888) (LPS 32708 Type). Prov. Buenos Aires, San Juan Calingasta, *Singer T-3893* (BAFC). Sierra de La Ventana, *Singer & Wright S-224 & S-241* (BAFC; MICH); *S-351* (BAFC). Ezeiza, *Wright* s.n. (30-V-1968) (BAFC).

SWITZERLAND, Jura, Canton de Neuchâtel, Bayards, *Marti & Huijsman* s.n. (Jun. 1, 1959) (L 3915-2 Type of *P. merdicola*).

DISCUSSION. *P. argentina* is very close to *P. coprophila* (Bull. ex Fr.) Kumm. from which it is separated only by the spores size and for the distribution. *P. coprophila* grows mainly in the tropics and subtropics and is very rare in temperate zones, and has small spores. The smaller spores in tropical species seems to be a primitive feature in *Psilocybe*, as Guzmán (1978c) discussed in the hallucinogenic species found in the tropical rain forest.

P. coprophila reported by Høiland (1978) from Norway seems to belongs to *P. argentina* because he described spores 10.5-15 (-16.5) × 7.5-9 (-9.7). Chemical analyses in Norway's fungus showed no content of psilocybin, according to Høiland (1978). *P. merdicola* described by Huijsman (1961) from Jura at Switzerland (Type locality) also is a synonym with *P. argentina*, because after the author studied the type he did not find any difference between both species. Huijsman described spores 12.8-15.8 (-17.2) × 7.8-9.3 μm, and cheilocystidia 25-43 × 7-11.5 μm. He thought that *Stropharia merdaria* f. *macrospora* Möller is a synonym of *P. merdicola*, but Möller's fungus has a well formed annulus and was described by Guzmán (1978a) as *P. moellerii* in the Section *Merdariae* (see that).

SELECTED ILLUSTRATIONS. Huijsman (1961, Figs. 6-9 as *P. merdicola*) (see also note in Selected illustrations in *P. coprophila*).

71. *Psilocybe coprophila* (Bull. ex Fr.) Kummer *Führ. Pilzk.* p. 71, 1871
Figs. 383-387, 653, 679, 746 & 768

Agaricus coprophilus Bull., *Herb. Fr.*, t. 566, fig. 3, 1792.
A. coprophilus Fr., *Syst. Myc.* 1, p. 297, 1821.
A. fimicola Pers., *Synop. Meth. Fung.*, p. 412, 1801.
Geophila coprophila (Fr.) Quél., *Enchir. Fung.*, p. 114, 1886.
Deconica coprophila (Bull. ex Fr.) Karst., *Hattsv. I.*, p. 515, 1879.
Panaeolus digressus Peck, *Bull. Torrey Bot. Club* 22: 205, 1895.
Deconica digressa (Peck) Morgan, *Jour. Myc.* 13: 143, 1907.
Stropharia coprophila (Fr.) Lange, *Dansk Bot. Arkiv.* 9 (1): 32, 1936.
S. coprophila f. *etiolata* Lange, *op. cit.*, p. 32, 1936.
S. coprophila f. *subetiolata* Lange, *op. cit.*, p. 32, 1936.
Psilocybe mutans Mcknight, *Bull. Torr. Bot. Club* 98: 4, 1971.
P. praetervisa Sing., *Nova Hedwigia* 29, p. 244, 1969.

Pileus (5-) 8-15 (-30) mm in diam., subglobose to convex, becoming plane or sometimes slightly umbonate or subumbonate, glabrous, but when young the margin has white floccose patches from the veil remnants, even to slightly striate at the margin when moist, viscid to lubricous, shiny when dry, but with a translucent separable pellicle when fresh; hygrophanous, dark reddish brown or orangish brown, fading straw color and opaque.

Lamellae broadly adnate to somewhat subdecurrent, pale brownish to purplish brown and finally brown violaceous, somewhat mottled, with whitish and slightly fimbriate edges.

Stipe (15-) 25-40 (-50) × (1-) 2-4 mm, equal or slightly narrowed above or subbulbous, straight or sometimes curved, fistulose, apex pruinose, floccose fibrillose over lower portion, but glabrous when mature, whitish to brownish, more darker below.

Veil poorly developed, only as arachnoid or floccose white fibrils or patches in young specimens. Annulus absent.

Context pliant, whitish to brownish or concolorous with pileus, unchanging on exposure. Subfibrillose and brownish the stipe. Odor and taste slightly fungoid.

Spore print blackish violaceous brown.

Spores (9-) 10-12 (-14) × (6-) 7-9 × 6-7.1 μ m, subhexagonal in face view, subellipsoid in side view, thick walled (up to 1 μ m) pale to dark yellowish brown, with a broad plane germ pore.

Basidia 25-34 × 9-12 μ m, 4-spored, hyaline, ventricose-subcylindric or subpyriform, with a slight medial constriction.

Plerocystidia absent or when present very rare and similar cheilocystidia or slightly more broader (8-10 μ m) with a more robust neck (up to 5 μ m in diam.).

Cheilocystidia 22-35 (-44) × (5-) 7.5-8.5 μ m, abundant, sometimes forming a sterile band, hyaline, fusoid-ventricose or lageniform, with a short or long neck, 2-4 μ m broad.

Subhymenium seemingly subcellular, the hyphae walls with irregularly orangish

pigment. Trama parallel or somewhat interwoven hyaline or hyphae somewhat incrustated. Epicutis with a gelatinous hyaline pellicle of narrow hyaline hyphae 2-3 μ m diam. Hypodermium subcellular similar to the subhymenium, with incrustated hyphae 6-15 μ m diam. Clamp connections present.

HABITAT AND DISTRIBUTION. Scattered to gregarious in dense groups, rarely solitary, on dung (cow, horse, donkey, sheep, rabbits, and probably other animals); rarely on rich soil. Common in sunny places, grassland meadows, trails, roadsides, gardens, etc.; widespread in tropical, subtropical and subtemperate regions. Unknown in cold lands such as high mountains or in temperate boreal or austral regions. Fruiting almost all the year, but mainly in the rainy season.

STUDIED MATERIAL. CANADA, Quebec, Gaspe, Cooke 31597 (ENCB).

U.S.A., Alabama, Monterrey, *Hesler* s.n. (TENN 21993, as *P. atrorufa*). California, Santa Clara, *Leslie* 3082, 3227, 3530, 4132, 4141, 4144 & 4150 (all in ENCB). Pasadena, *Peck* s.n. (NYS Type of *Panaeolus digressus*). Massachusetts, Arlington, *Singer* s.n. (Nov. 12, 1946) (FH as *P. merdaria*). Missouri, near St. Louis, *Glatfelter* 955 (BPI). Montana (unknown locality, cultures), *Mcknight* F-1799 (MICH Type of *P. mutans*). Oregon, Lane, *Leslie* 3958 (ENCB).

CUBA, without locality, *Wright* 5488 (FH as *Agaricus bullaceus*).

MEXICO. Chiapas road, Teapa to Tuxtla Gutiérrez, near Bochil, *Guzmán* 10397 (ENCB). Near Rayón, *Guzmán* 10435 (ENCB). Lagos de Montebello, *Guzmán* 10498 (ENCB). Distrito Federal, Cerro de Iztapalapa, *Guzmán* 16458 (ENCB). Near Xochimilco, *Guzmán* 11484 (ENCB). Mexico City, *Guzmán* 1365 (ENCB). Atzacapotzalco, *May Nah* s.n. (Sept. 3, 1958) (ENCB). Durango, road Zacatecas to Zuchil, *Guzmán* 3349 (ENCB). Jalisco, Guadalajara, *Guzmán* 16089 & 16094 (ENCB). Guadalajara to La Piedad, Barranca Rio Santiago, *Guzmán* 12357 (ENCB). Near Huascato, road to Piedad to Guadalajara *Guzmán* 12340 (ENCB). Tamazula, *Guzmán* 16734 (ENCB). Western Lake of Chapala, San Pedro Tezistán, *Guzmán* 11569-C, 11587 & 11596 (ENCB). Guerrero, Chilpancingo to Acapulco, Rincón de la Vía, *Pascoe* 40 (ENCB). San Lucas, SW Chilapa, *Alarcón* 46 (ENCB). Hidalgo, Xochicoatlán, *Dueñas* s.n. (Febr. 4, 1980) (ENCB). NW of Pachuca, *Guzmán* 10881 (ENCB). Near Huasca, *Guzmán* 10891 (ENCB). State of Mexico, near Nopala, *Guzmán* 4021 (ENCB). Naucalpan to Toluca, near Chimalpa, *Guzmán* 5934 (ENCB). North of Tepozotlán, *Guzmán* 4016 (ENCB). Near Santa Clara, *Ramírez* 171 (ENCB). Southern Villa del Carbón, *Mendarosqueta* 4 (ENCB); *Guzmán* 6590 (ENCB). North of Valle de Bravo, San Cayetano Station, *Guzmán* 1064 (ENCB). Tlalpujahuala, *Ornelas* s.n. (Aug. 1979) (ENCB). Eastern Tlalnepantla, *Moreno* s.n. (Jul. 22, 1973) (ENCB). Near Temascaltepec, *Guzmán* 8335 (ENCB). North of Acambay, *Guzmán* 9318; 9338 (ENCB); 9337 (ENCB; NY). Near Amecameca, *Guzmán* 10078 (ENCB). Presa Guadalupe, *Guzmán* 5856 (ENCB). Zumpango, *Magaña* 28 (ENCB). Las Arboledas, Cerro de Tequesquahuac, *Guzmán* 9350 (ENCB). Amecameca to Tlamacas, *Ott & Pollock* 76-25 (ENCB). State of Michoacan, Southern La Piedad, *Guzmán* 11785 (ENCB). South Zinapecuaro, *Díaz-Moreno* s.n. (Jul. 26, 1970) (ENCB). Near Zitacuaro, Presa El Bosque, *Calderón* s.n. (Aug. 17, 1976) (ENCB). State of Morelos, near Huitzilac, *Pascoe* 202

(ENCB). Tepoztlán, *Salinas* s.n. (Jul. 10, 1966) (ENCB). Nuevo Leon, Galeana to Cerro del Potosí, *Flores* 7 (ENCB). State of Oaxaca, Huautla de Jiménez, *Guzmán* 908 & 1900 (ENCB); *Pollock* 5176 (ENCB). Temazcal, *Guzmán* 1924; 16301-A (ENCB). San Miguel Progreso, *Leslie* 1410, 1411, 1413, 1416 & 1983 (all in ENCB); 1981 (part) (ENCB). Mije zone, Ayautla, *Jacobs* 44 (ENCB). Amatepec, *Jacobs* 9 (ENCB). Road Tuxtepec-Oaxaca, Puerta del Sol, *Pérez-Ortiz* 91 (ENCB). Near Ojitlan, *Guzmán* 16159 (ENCB). State of Queretaro, Municipio de Lande, South-western Lobo (Huasteca zone), *Guzmán* 3725 (ENCB). State of Puebla, near Puebla City, *Servín Massieu* s.n. (Oct. 17, 1965) (ENCB). Zacatlán, *Zárate* s.n. (Aug. 1975) (ENCB). State of Tlaxcala, Panotlán, *Ramos* 21 (ENCB). State of Veracruz, near Cordoba, *Murrill* 887 (NY as *P. bullacea*). Road Cordoba to Veracruz, San José de Gracia, *Guzmán* 10145 (ENCB). Atzalán, *Ventura* 1848 (ENCB). Jalapa, *López* 951 (ENCB); *Murrill* 29 (NY as *P. bullacea*); *Ventura* 2297 & 10176 (ENCB). Chiconiquiaco to Santa Rita, near Paz de Enriquez, *Guzmán* 17010 (ENCB). Salto de Eyi-pantla, *Guzmán* 17215 (ENCB). Near Catemaco, *García* 1 (ENCB). Catemaco to Santecomapa, *Guzmán* 17151 & 17161 (ENCB). Near Huatusco, *Pollock* 7/23/78-3 (ENCB); *Guzmán* 16327 (ENCB). State of Zacatecas, road to Aguascalientes, near Luis Moya, *Guzmán* 3352 (ENCB).

GUATEMALA, Quiche zone, near Chajul, *Torres* s.n. (Dec. 13, 1978) (USCG; ENCB).

PANAMA, Prov. Chiriqui, road El Alto del Volcán to Cerro Punta, near Aguacate, *Dumont* PA-2117 (NY).

COLOMBIA, Dept. Boyaca, Mpio. Charala, corregimiento de Virolin, margen del Río Luisito, *Díaz* s.n. (1-XII-78) (COL).

VENEZUELA, North of Merida, San Javier, *Guzmán* 9180 (ENCB).

BRAZIL, Sao Paulo, 10 km Eastern Campos Jardim, *Guzmán* 8913 (ENCB).

ECUADOR, road to Loja, 12 km from Zamora, *Dumont* EC-1886 (NY).

ARGENTINA, Prov. Neuquen, Lago Correntoso, *Singer* M-3506 (BAFC Type of *P. praetervisa*). Prov. Tucumán, Northern Tañi del Valle, *Guzmán* 8722; *Singer* B-3045 (LIL as *P. merdaria*).

BELGIUM, Bruxelles, *Heinemann* 482 (BR as *Stropharia merdaria*). Hainaut, *Heinemann* 1175 (LFG). Antwerpen, Ravels, *Darimont* s.n. (3-X-1943) (LG).

CZECHOSLOVAKIA, Pokřians, Precon, *Inmobylirtz* s.n. (Oct. 10, 1891) (BRA as *P. bullacea*).

GREAT BRITAIN, Halifax, Yorks, *Watling* s.n. (May 16, 1954) (K). Malmamm, The Lings, *Orton* 2252 & 2353 (E).

HOLLAND, Without locality, *Koofman* 292 (L).

HUNGARY, Varoslod, *Bohus* & *Babos* s.n. (19-X-1960) (BP 31197) Budakalasz, Mts. Pilis, *Bohus* & *Babos* s.n. (11-XI-1966) (BP 44906); *Hazslinskyl* s.n. (BP 18953).

NORGAY, Nannestad, Hurdalssjoeu, *Gulden* 969-68 (0).

SWEDEN, Femsjo, Smaland, *Lundell* 1146 (*Fungi Exsiccata Suecici*) (UPS and several other herbaria); *Lundell* 3685 (UPS as *P. bullacea*); *Lundell* & *Haglund* 5461 (UPS as *P. bullacea*); *Moser* s.n. (16-7-1961) (TENN 25148 as *P. merdaria*). Vast-wankand, Sala, *Morander* 1048 (UPS as *P. bullacea*). Western Eriksberg, Hagadelen, *Berit* & *Eriksson* 2821 (UPS). Vastergotland, Goteborg, Slottsskagen, *Not-horst-Windahl* 3934 & 6660 (GB as *P. merdaria*). Veflforl, Vale, *Stordal* 4366 (UPS).

CHINA, Hunan, Wukang, *Handell-Mazzetti* 2605 (W).

JAPAN, Kyoto, *Urayama* 1954 (MICH as *P. paneoliformis*). Chusuyam, Otsu, *Hongo* 502 (Hongo Herb.).

NEW GUINEA, Papua, Central District, Woitape, *Yokoyama* 2093 (Hongo Herb.; ENCB; TNS, PNG).

AUSTRALIA, Mount Lofty, Bridgewater, *Woollaston* 15 (AD as *Stropharia merdaria*).

HAWAII, Honolulu, Laupahoe Loe Beach Park, *Ueki* 134 (HAW; ENCB).

DISCUSSION. *Panaeolus digressus* Peck, *Psilocybe mutans* McKnight and *P. praetervisa* Sing. are considered here synonyms of *P. coprophila* after the study of their respective types (at NYS, MICH and BAFC). In fact, all the macroscopic and microscopic features are the same in these fungi, except for *P. mutans* which, like all the cultured fungi, shows some variation in the carpophores (the pileus is 5-9 mm diam). *Guzmán* has obtained carpophores in cultures of *P. coprophila* with a pileus 2 mm diam. and stipe longer and thinner than in the normal wild specimens. McKnight (1953; 1971) observed in cultures obtained from wild carpophores of *P. coprophila* from Montana, U.S.A. (collected by A.H. Smith) an anomalous fungus that he described as *P. mutans* Mack. He obtained both agaricoid and gastroid basidiocarps; the latter with or without stipe and very similar to a *Morchella* type fruit body. Microscopically he observed oidia in different stages, lactifers hyphae, and abnormal basidia. McKnight's observations agree with those of Watling (1971) for *P. merdaria* and more or less with Heim & Cailleux (in Heim & Wasson, 1958) in different species. It seems that the first observations of the oidia in the genus *Psilocybe* were made by Gilmore (1926), who reported these in *P. coprophila* (see also Nobles, 1935).

Fries (1820-1832) first considered *Agaricus coprophilus* in the tribe *Psathyra*, but latter (1836-1838) he transferred it to the tribe *Psilocybe*. In both cases he considered *Agaricus fimicola* Pers. a synonym. Persoon (1801) placed this fungus in the Section *Coprinus*.

P. coprophila has not hallucinogenic properties, but according to Leslie & Repke (personal communication) it has psilocybin. That study was based on Californian and Mexican material. But, some specimens studied by Leslie and Repke and deposited at ENCB are a mixture of *Panaeolus* sp. and *Psathyrella* sp., together with *Psilocybe coprophila*. At least this is true of the *Leslie* 1981 collection at ENCB.

It is interesting to note the wide distribution of *P. coprophila* in Mexico, where it grows in everywhere except in the high mountains. There it is replaced by *P. argentina* (Speg.) Sing. which differs from *P. coprophila* for its large spores. *P. coprophila* grows in Mexico in tropical, subtropical and temperate zones, including the arid regions of the North. However, because it is fimicolous, it is very common in disturbed ecological regions where cattle or horses are common. There are no reports of *P. coprophila* as an hallucinogenic fungi, in spite of its widespread distribution. If the Mexican Indians that known perfectly the hallucinogenic species of *Psilocybe* say that *P. coprophila* is not "magic" nor "sacred", it is very probable that *P. coprophila* does not have any hallucinogenic properties.

With the widespread distribution of *P. coprophila*, there are several reports of this species from Europe and America. From North America, there are the records of Morgan (1907), Murrill (1922-b); Wehmeyer (1947); Miller (1972), Duffy & Vergeer (1977), Stamets (1978) and Bigelow (1978). From South America and Mexico, there are the records of Guzmán *et al.* (1977), Guzmán (1978a), Rick (1961), Murrill (1918 & 1922b, both as *Deconica bullacea*), Singer (1969, as *P. praetervisa*), Herter (1933), and Dennis (1970).

Reports of *P. coprophila* from Europe besides of those of the synonyms, are in Lundell & Nannfeldt (*Fungi Exsiccati Suecici*, No. 1146, first reported as *P. bullacea*), Berkeley & Broome (1837-1885), Quélet (1872, 1888), Saccardo (1887), Smith (1908), Ricken (1915; 1920), Venenovsky (1920), Konrad & Maublanc (1924-1937), Bresadola (1931), Lange (1936), Schäfer (1945), Favre (1948 & 1960), Kühner & Romagnesi (1953), Strauss (1959 & 1969), Schulmann (1960), Eliade (1961), Lange & Hora (1963), Moser (1967), Lange & Skifte (1967), Babos (1968), Orton (1969), Kreisel (1970), Pegler & Young (1971), Urbonas *et al.* (1974), Dennis *et al.* (1974), and Bresinsky & Haas (1976). The report of Høiland (1978) from Norway as was discussed maybe belongs to *P. argentina*, because he described larger spores 10.5-15 (-16.5) μ m long. *P. coprophila* has been reported from Australia by Cleland (1934) and Guzmán & Watling (1978). Urayama's report (1957) on *P. paneoliformis* Murr. from Japan really belongs to *P. coprophila* (at least the material deposited in MICH). Watling & Gregory (1980) reported *P. coprophila* from Kashmir (North of India). From Africa there are the reports of Pegler (1977), and Malençon & Bertault (1970). Hongo (1965) reported *P. coprophila* from Pakistan. Yokoyama (1979) reported *P. coprophila* from New Guinea. Möller's report (1945) of *Stropharia coprophila* (Bull. ex Fr.) Lange from Faerøes is *P. subcoprophila* (Britz.) Sacc., according to Orton (1968).

The name of this species refers to the fimicolous habitat.

SELECTED ILLUSTRATIONS. Stamets (1978, Fig. 14 as "*P. coprophila* complex") (maybe this figure belongs to *P. argentina* (Speg.) Sing.) Laplanche (1894) cited the figures: Britzelmayer (Derm. et Mel. f. 17, 34, 119, 120), Bulliard (t. 566, f. 3), Cooke (t. 608, f. A), and Quélet (Vosges et Jura, t. 7, f. 6).

72. *Psilocybe fuegiana* (Horak) Sing. *Nova Hedwigia* 29: 256, 1969. Figs. 388-390

Deconica fuegiana Horak, *Darwiniana* 14: 369, 1967.

Pileus (10-) 20-25 (-30) mm in diam., conic to convex or subumbonate to subcampanulate, glabrous, even, with slightly striate margin when moist, subviscid, hygrophanous, reddish brown or orangish brown, fading to brownish yellowish or straw color.

Lamellae broad adnate to subdecurrent, brownish to deep tobacco brown or violaceous black, with whitish and more or less even edges.

Stipe (25-) 30-45 $\times$ (2-) 3-5 mm, equal, or somewhat subbulbous, solid to hollow, surface fibrillose, whitish to almost concolorous or yellowish with the pileus toward the base. White myceloid at base.

Veil thin, cortinated and poorly developed, not forming an annulus.

Context whitish to almost concolorous with pileus, somewhat pliant. Odor and taste slightly fungoid.

Spores (8.2-) 9.9-11.5 (-12) $\times$ 6-7.5 $\times$ 5.5-6.6 μ m, subhexagonal in face view, subellipsoid in side view, thick walled, yellowish brown, truncate and with broadly flat germ pore.

Basidia 19-28 $\times$ 7-11 μ m, 4-spored, hyaline, ventricose to subpyriform.

Pleurocystidia absent or scarce, similar to the cheilocystidia.

Cheilocystidia 18-30 (-32) $\times$ (4-) 5-7.7 (-12) μ m, hyaline, abundant, forming a sterile band, sublageniform to lageniform, or clavate to subfusoid, sometimes with a short mucron; when lageniform the neck is somewhat flexuous 3-4 μ m broad.

Subhymenium hyaline, somewhat incrustated on the walls with brownish pigment. Trama parallel, with more or less thin walled hyphae. Hypodermium formed by subglobose cells 10-18 μ m broad, hyaline or brownish, irregularly incrustated on the walls. Epicutis as a subgelatinized thin layer of elongated hyaline hyphae, 2-6 μ m diam. Clamp connections present but as for many species of the genus, they are not abundant.

HABITAT AND DISTRIBUTION. Solitary or scattered on soil or rich soil. Fruiting in the rainy season (January-April in Austral regions, or in July in Boreal regions). Known only from southern Argentina and Michigan, U.S.A.

STUDIED MATERIAL. U.S.A., Michigan, Barages, L'Anse, *Selinger* 3177 (MICH).

ARGENTINA, Tierra del Fuego, Ushuaia, *Spegazzini* s.n. (Type LPS 34192 as *Deconica coprophila*).

DISCUSSION. This species is close to *P. panaeoliformis* Murr., but is apparently differs in the short cheilocystidia, 12-20 μ m long and in the long stipe in that species. Horak (1967) described *P. fuegiana* based only in the Spegazzini's specimen, collected in January 18, 1924 on soil. "Pileo lutescens, stipes albescens, basi

lutescens'', wrote Spegazzini in the sheet. Horak (*op. cit.*) did not report clamp connections, but as Singer (1969) stated, they are present in the Spegazzini's specimen. Singer (*op. cit.*) also described as *P. fuegiana* a fungus collected by him in a *Austrocedrus* forest in Neuquén, in Southern Argentina, but with spores "not visibly lentiform'', contrary to the spores of the type are conspicuous subhexagonal. Then Singer's fungus does not belong to this Section *Coprophilae* for the subellipsoid spores. The specimen reported here from U.S.A. is a new record of *P. fuegiana*, first in North America.

The name of the species refers to the type locality region's name: Tierra de Fuego.

73. *Psilocybe panaeoliformis* Murrill *Mycologia* 15: 12, 1923.

Figs. 410-412

Pileus 10-25 mm in diam. convex to subcampanulate or campanulate, only partly expanding with age, subviscid to dry, slightly fibrillose to glabrous, even but somewhat striate at the margin when moist, hygrophanous, brown to dull grayish brown, fading to brownish yellowish.

Lamellae sinuate or adnexed, sometimes nearly free in old specimens, dark gray or tawny to blackish violet brown, with whitish edges.

Stipe 50-100 × 1-2 mm equal, slightly fibrillose to glabrous, cartilaginous, hollow, whitish to reddish brown.

Context whitish to concolorous with pileus. Taste and odor not checked.

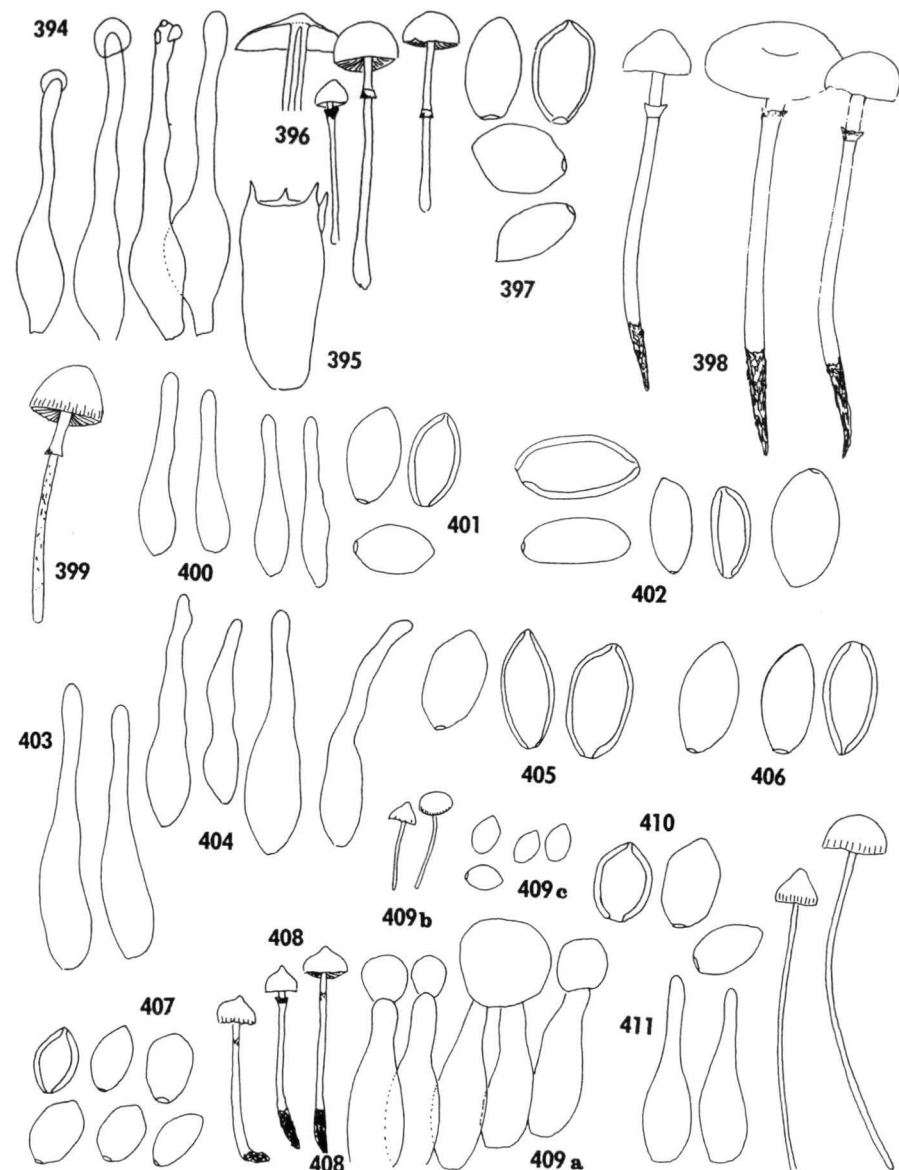
Spores (8.5-) 9.9-11 (-11.5) × 6-7.1 (-8) × 5.5-6 µm, angular or subexagonal or obscurely ellipsoid to ovate as seen in face view, subellipsoid in side view, brown yellowish, thick walled, with truncate apex caused by a hyaline germ pore.

Basidia 14-16 × 8-9 µm, 4-spored, subventricose, hyaline.

Pleurocystidia none seen.

Cheilocystidia 12-20 × 4-8 µm, very abundant and forming a sterile band, hyaline, ventricose at base and abruptly narrowed to a slender flexuous neck, apices subacute; sometimes with an hyaline viscous drop at the apex.

Plate 29: Figs. 394-412. - Several species of *Psilocybe*. 394-397: *P. moellerii*, 394: Cheilocystidia, 395: Basidium, 396: Carpophores, 397: Spores (all from the type). 398: *P. subannelariiformis*, carpophores (type). 399-401: *P. merdaria*, 399: Carpophore, 400: Cheilocystidia, 401: Spores (399: Smith 27735; 400-401: Watling). 402-403: *P. subcoprophila*, 402: Spores, 403: Cheilocystidia, (402: Lange 505; 403: Orton 3774). 404-405: *P. argentina*, 404: Cheilocystidia; 405: Spores (type of *P. merdaria*). 406: *P. subcoprophila*, Spores (type of *Deconica australis*). 407-409A: *P. anellariiformis*, 407: Spores, 408: Carpophores, 409A: Cheilocystidia (407-408: type, 409A: Singer F-1799). 409B-C: *P. peruviana*, B: Carpophores, C: Spores (both from the type). 410-413: *P. panaeoliformis*, 410: Spores, 411: Cheilocystidia, 412: Carpophores (all from the type).



Subhymenium subcellular, pallid brown, with slightly incrusting pigment on the walls. Trama parallel, pallid brown or hyaline. Epicutis formed by subgelatinous, narrow (1.5-3 μm) filamentous hyaline hyphae. Hypodermium similar to the subhymenium, with globose to enlarged cinnamon-brown elements. Clamp connections present.

HABITAT AND DISTRIBUTION. Solitary, gregarious, or scattered on dung or rich soil. Fruiting in September-October. Known only from Southeastern U.S.A. and U.S.S.R.

STUDIED MATERIAL.

U.S.A., Mississippi, Biloxi, *Earle* s.n. (Sept. 2, 1904) (NY Type). Alabama, Auburn, *Earle* s.n. (Oct. 14, 1900) (NY). Texas, Central part, local State Park, *Loftis* s.n. (Febr. 21, 1979) (ENCB).

U.S.S.R., Ljumbata, Viborgs, *Thesleff* s.n. (26-VII-1892) (H as *Deconica atrorufa*).

DISCUSSION. This species is close to *P. fuegiana* (Horak) Sing. (see discussion of that). The carpophores are like those of *Panaeolus*, group *sphinctrinus*, with adnexed or sinuate gills. Smith (1948) reported "a few pileocystidia similar to cheilocystidia" in the pileus, a feature not observed by the author. *P. panaeoliformis* reported by Kitamoto *et al.* (1975) in Japan may belong to *P. coprophila*, as discussed under in that species.

Guzmán (1978a) and Yokoyama (1979) reported *P. panaeoliformis* from Ecuador and New Guinea, respectively, but really these fungi belong to *P. pseudobullacea* (Petch) Pegler because an annulus is present (see discussion of that species). The material from Texas was first collected on rabbit dung, and then placed in a glass chamber in the laboratory, where Loftis collected the specimens sent to the author for study.

The name of the species refers to the form of this fungus like to a *Panaeolus* species.

74. ***Psilocybe subbrevis*** Smith & Hesler *Journ. Elisha Mitchell Sci. Soc.* 62: 195. 1947. Figs. 391-393

Pileus 10-15 cm in diam., convex to subumbonate or somewhat plane, not truly umbonate, lubricous or subviscid, even to substriate at the margin, when moist, glabrous or dotted with minute blackish squamules from the veil, surface hygrophanous, dark watery brown wet, tawny or straw color when faded, sometimes drying dark reddish brown.

Lamellae adnate to adnexed, extending down the stipe somewhat as prominent ridges, brownish pallid then dark brown to dark brown, violaceous, somewhat mottled, dusted by the spores, edges white and fimbriate.

Stipe 20-25 $\times$ 1-1.5 mm, equal, hollow, brown to concolorous with pileus when dried, fibrillose; base with white myceloid.

Veil poorly developed at least in the adult stages.

Context whitish to concolorous with the pileus; taste and odor not checked.

Spore print dark purple brown.

Spores (9-) 10-13.6 (-14.5) $\times$ 7-8.6 μm , subhexagonal or obscurely subrhomboid in face view, subellipsoid in side view, thick walled, yellowish brown with broad or narrow apical germ pore.

Basidia 24-28 (-30) $\times$ 9-10 μm , 4-spored, hyaline or pale yellowish, clavate to subcylindric.

Pleurocystidia 30-42 $\times$ 10-13 μm , rare, hyaline, thin walled, fusoid-ventricose, with more or less developed pedicel, apex obtuse to mucronate.

Cheilocystidia 22-28 $\times$ 5-7 μm , abundant, fusoid ventricose or sublageniform, with short to long neck, hyaline, thin walled.

Subhymenium brownish, subcellular, hyphae with incrusting brown-orange pigment. Trama parallel, brownish to hyaline, with some incrusting walls. Epicutis a thin gelatinous pellicle of brownish to nearly hyaline, narrow (2-5 μm) hyphae, 8-14 μm diam. Clamp connections present.

HABITAT AND DISTRIBUTION. Scattered on soil (very probably rich soil), on trails of the deciduous forests. Fruiting on July. Known only from the type locality.

STUDIED MATERIAL. U.S.A., Tennessee, La Follette, *Hesler 10149* (Type TENN, Isotype MICH).

DISCUSSION. The presence of pleurocystidia separate well this species from the others of the Section. Smith & Hesler (1946) related *P. subbrevis* to *P. montana* (Pers. ex Fr.) Kumm. group (they cited that species as *P. atrorufa* (Schaeff., ex Fr.) Quél.) but the large and subhexagonal spores separate *P. subbrevis* from that group (Section *Psilocybe*).

The name of the species refers to the more or less short stipe (*brevis*, short; *pes*, foot).

Section Merdariae (Fr.) Sing.
Lilloa 22: 506, 1949.

Spores subhexagonal, thick walled. Pleurocystidia absent. Fimicolous or subfimicolous fungi but sometimes they grow on other materials (see habitat of *P. merdaria* and *P. pseudobullacea*). Type species: *P. merdaria* (Fr.) Ricken.

Key to species

- 1a. Species with pseudorhiza..... 2
- 1b. Species without pseudorhiza..... 3
- 2a. Spores broad (9-) 10-12 (-13.5) $\times$ (7-) 8.4-9.6 (-10.5) μ m. 75. *P. anellariiformis*
- 2b. Spores narrow 9-12 $\times$ 6-7.5 μ m..... 79. *P. subanellariiformis*
- 3a. Spores (8.2-) 9.3-11 (-12) μ m long. Species known only from the tropics and subtropics..... 78. *P. pseudobullacea*
- 3b. Spores larger than in above choice..... 4
- 4a. Spores (10-) 11-13 (-14) μ m long. Widespread species in temperate zones..... 76. *P. merdaria*
- 4b. Spores (11-) 13-14 (-16) μ m long. Species known only from cold regions..... 77. *P. moellerii*

75. *Psilocybe anellariiformis* (Murr.) Sing. *Beih. Sydowia* 7: 82, 1973.

Figs. 407-409A

Stropharia anellariiformis Murr., *Mycologia* 14: 129, 1922.

Pileus 10-20 (-25) mm in diam., conic to convex or campanulate, glabrous and even, not or somewhat striate at the margin when dry, viscid, brownish to pale tan, seems hygrophanous, fading to straw color.

Lamellae adnate to short subdecurrent, subdistant, pale tan to fuscous or dark brown violaceous, with whitish edges.

Stipe 30-50 $\times$ 2-3 mm, equal, subcylindric and somewhat flexuosus, larger towards the apex, smooth or floccose above, fibrillose below, hollow, dry, whitish to concolorous with pileus, somewhat reddish brown, usually with a well formed pseudorhiza.

Veil well developed, white, arachnoid to membranous, forming a white and membranous permanent annulus, distant about 1 cm from the pileus.

Context somewhat pliant, whitish, unchanging.

Spores (9-) 10-12 (-13.5) $\times$ (7-) 8.4-9.6 (-10.5) $\times$ 4.8-7.5 μ m, subhexagonal in face view, subellipsoid in side view, thick walled (0.5-1 μ m), pale to dark brown, with a broad and plane germ pore.

Basidia 16-22 $\times$ 8-12 μ m, 4-spored, pyriform, hyaline.

Pleurocystidia absent.

Cheilocystidia 17-35 $\times$ 5-8 μ m, abundant, hyaline, ventricose-fusoid with a short neck, 4-5 μ m broad, frequently with a viscous hyaline drop on the apex, 4-22 μ m diam.

Subhymenium subcellular, hyaline to brownish, with incrustated brownish orange pigment. Trama of parallel hyphae with brownish pigment not incrustated. Epicutis formed by a thick, hyaline, gelatinized layer of parallel hyphae. Hypodermium of hyaline to brownish hyphae, with somewhat globose cells. Clamp connections present.

HABITAT AND DISTRIBUTION. Gregarious on dung in pastures. Known only from the type locality. Fruiting from March to September.

STUDIED MATERIAL. U.S.A., Florida, Alachua, Micanopy to Alachua, Payne's prairie, *Singer F-1799* (FH). Hatchet Creek, *Murrill F-16197* (FLAS). New Orleans, Louisiana, *Earle 43* (Type NY).

DISCUSSION. A species close to *P. subanellariiformis* Guzmán (see key). The type does not have pseudorhiza, but the other collections examined have it, then it is probable that in the type the pseudorhiza was broken in the process of collection the specimens. However Murrill (1922a) did not mention the pseudorhiza. Singer in a note on the specimen Murrill F-16197 at FLAS Herbarium wrote: "This is the true *S. anellariiformis* Murr.; A.H. Smith's from Michigan being wrong". Smith's fungus is *P. subanellariiformis* Guzmán (see that in this Section). Singer (1973) made the combination of Murrill's species in the genus *Psilocybe*.

The name of the species refers that has a little ring on the stipe (*anellus*, little ring), or also refers that is like to the genus *Anellaria*.

76. *Psilocybe merdaria* (Fr.) Ricken *Blätterpilze*, p. 251, 1915.

Figs. 399-401 & 678 & Map 2 (Plate 5)

Agaricus merdarius Fr., *Syst. Myc.* 1, p. 291, 1821.

Stropharia merdaria (Fr.) Quél., *Champ. Jura Vosges* 1: 142, 1872.

Geophila merdaria (Fr.) Quél., *Enchir.*, p. 112, 1886.

Fungus merdarius Kuntze, *Rev. Gen. Pl.* 3: 480, 1898.

Psalliota merdaria (Fr.) P. Henn., in Engl. & Prantl, *Nat. Pflanzenfam.* 1, 1**, p. 238, 1900.

Psilocybe merdaria var. *exigua* Möller, *Fungi Faerøes*, p. 196, 1945.

Pileus (5-) 10-25 (-35) mm in diam., convex, then subcampanulate, expanding to somewhat plane or slight depressed in old specimens, glabrous, even but margin appendiculate with white veil remains mainly in young stages; slightly striate at the

margin when moist, viscid, hygrophanous, reddish brown or brownish orange to brownish yellow, fading to ochraceous or straw color. No bluing when touched or injured.

Lamellae broadly adnate, pale violaceous brown to darker, with edges white and fimbriate.

Stipe (15-) 30-55 (-80) $\times$ (1-) 1.5-2 (-4) mm, equal or somewhat thickened at the apex or subbulbous, hollow, tough, grayish white to brownish cinnamon toward the base, pruinose and somewhat striate at the apex, fibrillose floccose below. Unchanging in color when touched or injured.

Veil well developed, forming a more or less permanent white submembranous annulus, striate above, subfloccose below. The upper part concolorous with gills from the spores.

Context whitish to concolorous with pileus surface, pliant. Odor and taste not distinctive, or both are fungoid.

Spore print dark violaceous brown.

Spores (10-) 11-13 (-14) $\times$ 7-8 (-9) μ m, subhexagonal in face view, subellipsoid in side view, thick walled, yellowish brown and with a broad germ pore.

Basidia 20-30 $\times$ 8.8-10 μ m, 4-spored, hyaline, ventricose or subcylindric with a narrow base.

Pleurocystidia absent.

Cheilocystidia (20-) 25-33 $\times$ 6.6-8.8 μ m, abundant, forming a sterile band, hyaline, thin walled, subcylindric, moniliform, fusoid-ventricose or sublageniform with short neck 3.3-4.4 μ m broad.

Subhymenium subcellular, hyaline or pale brownish, with abundant orangish brown pigment irregularly incrusting on the walls. Trama regular, hyaline or yellowish, with somewhat incrusting pigment, hyphae elongated 4-6 μ m broad. Epicutis formed by a thin layer of gelatinous hyaline elongated hyphae, 1-3 μ m broad, walls somewhat incrusting. Hypodermium subcellular, subhyaline with incrusting pigment as in the subhymenium; hyphal cells elongated to subglobose, 5-17 μ m broad, thin walled. Clamp connections present.

HABITAT AND DISTRIBUTION. Scattered or more frequently gregarious on dung of herbivorous in particular but also on straw or piles of dung, and straw mixed with dung or refuse from paper mill, or compost, on very rich soil, or sewage, or garden soil in open sunny places, manured grasslands, or gardens, or roadsides. Widespread in temperate zones. Fruiting in the raining season.

STUDIED MATERIAL. GREENLAND. Ivigtut, *Lange* 23 (C).

CANADA, Quebec, *Cooke* 31597 (MICH).

U.S.A., Michigan, *Smith* 27735 (MICH). Oregon, Still Creek, Rhododendron, *Smith* 27735 (MICH).

BRAZIL, Apiai (Apiahy), *Puigari* 7 (Spegazzini Herb. at LPS, as *Stropharia merdaria*).

BELGIUM, Bruxelles, Brahaut, *Heinemann* 482 (BR).

CZECHOSLOVAKIA, Stanovisko, Kezmarok, *Koneckova* s.n. (Sept. 2, 1963) (BRA).

GREAT BRITAIN, Yorkshire, Halifax, *Watling* s.n. (May 16, 1954) (K).

FINLAND, Lapinlahti, *Schulmann* 46 (H as *P. coprophila*).

HOLLAND, Prov. Gelderland, Twello, *Hoofmanns* 292 (L).

HUNGARY, Without locality, *Hazslinsky* s.n. (BP 18963). Alberti-Isra, *Zolyomi* s.n. (BP 34247). Harshokorhegy, Montes Budai, *Bohus & Babos* s.n. (May 31, 1957) (BP 39691). Wogerandern, St. Goar, *Herpell* s.n. (1889) (BP 18969).

SWEDEN, Uppsala, *Holm & Melderis* s.n. (*Lundell* 46) (UPS, FH, MICH).

U.S.S.R., Leningrad, *Singer* s.n. (1937) (MICH as *Stropharia luteonites*).

JAPAN, Otso, Chusuyama, *Hongo* 502 (Hongo Herb.).

DISCUSSION. Fries (1821-1832) first described *Agaricus merdarius* in the tribe *Psilocybe*, but later (1836-1838) in the tribe *Psalliota*, and (1874) in the tribe *Stropharia*. *P. merdaria* has been considered for this reason in the genus *Stropharia* by several authors. But it has been confused with *P. moellerii* Guzmán, *P. coprophila* (Bull. ex. Fr.) Kumm., and *P. bullacea* (Bull. ex. Fr.) Kumm. The size of the spores and/or the annulus separate well this species from the others. However, it seems that the variation in *P. merdaria* provoked this confusion. Those materials reported by Guzmán (1978a) and Guzmán *et al.* (1977) as *P. merdaria* from Venezuela and Mexico, respectively, belong to *P. pseudobullacea* (Petch) Pegler, as will be discussed. The polymorphism in culture of *Psilocybe merdaria* was studied by Watling (1971). The fungus studied by him has spores 10-13 $\times$ 6-8 μ m. Watling obtained abnormal fruit-bodies like to those obtained by McKnight (1971) in *P. mutans* McKnight (= *P. coprophila*).

P. merdaria reported by Pegler & Rayner (1969) and Pegler (1977) may apply to *P. cubensis* (Earle) Sing. They reported a fimicolous fungus with spores 9-16 $\times$ 6.5-10 μ m and context not bluing, but "with a narrow greenish olivaceous region immediately above the lamellae" a feature not seen in *P. merdaria* (see discussion of *P. cubensis*). *P. merdaria* reported as *Geophila*, *Stropharia* or *Psilocybe* by Kauffman (1918), Velenovsky (1920), Rea (1922), Murrill (1922a) and Kühner & Romagnesi (1953) is *P. moellerii* Guzmán because on the large spores described by them, as will be discussed below.

A fungus from Romell Herb. collected on July 1888 and deposited in B and S Herbaria as *Agaricus (Stropharia) merdarius* Fr., is a species of *Stropharia*, for the conspicuous chrysocystidia. It is very interesting to see that a collection in the Fries Herbarium at UPS: *Oudemans* 230 (IX-1861) determined as *Agaricus (Psilocybe) merdarius* really is *Stropharia semiglobata* (Batch ex Fr.) Quel.; this shows the great confusion in the early concepts of *P. merdaria*.

Stropharia merdaria var. *exigua* Möller is obviously a synonym of the var. *merdaria*. Möller (1945) describes his variety on the smaller pileus, 5-12 mm in diam. *P. merdaria* has been reported from Europe and North Africa by Ricken (1915; 1920), Konrad & Maublanc (1924-1937), Lange (1936), Straus (1959), Schulmann (1960), Pegler (1966b), Malençon & Bertault (1970), Urbonas *et al.* (1974), Bresinsky & Haas (1976), Kalamees (1978), Jarva & Parmasto (1980), and Huijsman (1961). From North and South America there are the reports of Herter (1933), Lange (1955), Rick (1961), Stamets (1978), and Bigelow (1978). From Asia there are the report of Masse (1901), Pilát (1972) and Ito (1959), and from Australia the reports of Cooke (1892) and Cleland (1934). Many of these reports have not been checked by the author and some of these collections may belong to *P. moellerii* or other species close to *P. merdaria*. Morgan (1907, 1908) in his study on the Melanosporae from North America did not consider *P. merdaria*. Høiland's report (1978) of *P. merdaria* from Norway showed in the chemical analyses no content of psilocybin.

The name of the species refers to the habitat on dung.

SELECTED ILLUSTRATIONS. Stamets (1978, fig. 19). Ricken (1915, pl. 66, fig. 1). La-planche (1894) cited as *Stropharia merdaria* the figures: Britzelmayer (Derm. et Mel. f. 13), Buxbaum (C. IV, t. 16, f. 2), Cooke (t. 537), Fr. Icon. (t. 130, f. 3 (var.)), Gillet (t. 568), Lucand (t. 139), and Saunders & Smith (t. 25, f. inf.) (some of these may belong to *P. moellerii* (see below).

77. **Psilocybe moellerii** Guzmán *Mycotaxon* 7: 245, 1978.

Figs. 394-397, 741-743, 779-780 & Map 2 (Plate 5)

Stropharia merdaria f. *macrospora* Möller, *Fungi Faerøes* 1: 195, 1945.

S. merdaria Fr. sensu Rea, *Brit. Bas.* p. 129, 1922.

S. merdaria Fr. var. *major* (Fr.) Rea, *Idem.*, pag. 129, 1922.

S. ventricosa Mass. sensu Rea, *Idem.*, p. 129, 1922.

Geophila merdaria (Fr.) Kühner & Romagnesi, *Fl. anal. champ. sup.*, p. 336, 1953.

Psilocybe merdaria var. *macrospora* (Möller) Sing., *Nova Hedw.* 29: 243, 1969.

Pileus (10-) 20-30 (-45) mm in diam., convex to slightly subumbonate, expanding to convex-plane or almost plane or slightly depressed at the centre, glabrous, but margin with white floccose appendiculate remains from the veil, very conspicuous in young stages, surface even, viscid, with a translucent separable pellicle, margin translucent-striate when moist, hygrophanous, brownish cinnamon or brownish orange, fading to ochraceous, yellowish or straw color.

Lamellae broadly adnate to shortly decurrent, pale brownish to dark violaceous brown, somewhat mottled, edges somewhat floccose and whitish.

Stipe (20-) 30-50 (-85) × (1.5) 4-5 (-6) mm, equal or subbulbous, occasionally slightly enlarged at apex, more or less tough, fragile, flexuous, stuffed with a white pith to hollow, flocculose villous to silky-fibrillose below the zone of attachment of the veil to more or less glabrous, surface white to straw white.

Veil well developed, as white subfloccose mass, forming a more or less ephemeral

annulus, submembranous to fibrillose, white; in age frequently disappearing or leaving a collapsed fibrillose dark violaceous brown zone for the deposited spores.

Context fleshy, thick and white to whitish in the pileus; some pliant and brownish or fuscous in stipe. Unchanging on exposure. Odor and taste not distinctive. KOH reddish brown on pileus and context, negative on the stipe.

Spore print dark violaceous brown.

Spores (11-) 13-14 (-16) × (7-) 7.7-8.8 × 6.6-7.7 μm, subhexagonal in face view, subellipsoid in side view, thick walled, yellowish brown, with a broad apical germ pore.

Basidia 27-35 × 10-12 μm, 4-spored, rarely 2-spored, hyaline, ventricose-subclavate or pedicellate, sometimes with a slightly median constriction.

Pleurocystidia absent.

Cheilocystidia (18-) 25-40 × 4-9 (-11) μm, hyaline, very abundant, subcylindric, moniliform, ventricose fusoid or lageniform, sometimes somewhat pedicellate, neck flexuous 2.2-4 μm broad, sometimes with a hyaline drop of a viscous material at the apex.

Subhymenium subcellular, subhyaline with orangish brown or yellowish pigment incrusting on the walls. Trama more or less parallel, hyaline. Epicutis formed by a hyaline, subgelatinous layer of filamentous hyphae, 2-3 μm broad. Hypodermium brownish to hyaline, with elongated to subglobose hyphal cells, somewhat incrusting with brownish pigment. Clamp connections present.

HABITAT AND DISTRIBUTION. Solitary or more common gregarious in dense groups, sometimes caespitose, on dung (cow and horse) or on very rich soil in trails or corrals and cow yards. Fruiting in August to November in boreal regions or in January to March in Austral regions. Widespread species throughout cold or temperate-cold regions.

STUDIED MATERIAL. GREENLAND, Godthaad, Lange 82 (C as *P. merdaria*).

U.S.A., Oregon, Lane, Dunes City, Menser 873; 4556; 4557; 4559 & 4560 (ENCB); Guzmán 16664 (Type ENCB; Isotypes MICH & NY). Near Florence, Leslie 3768 (ENCB). Corvallis, Russman & Carpenter s.n. (Oct. 10, 1975) (OSU 35176 as *Panaeolus separatus*). Clackamas, Jacobs s.n. (Jun. 13, 1978) (ENCB). Clatsop, Rodeo Grounds, Menser 4530 & 4532 (ENCB). Washington, Thuston, Leslie 3715 & 3768 (ENCB).

PERU, Dept. Junin, Hyancayo to Statipo road, Dumont PE-1345 (NY).

ARGENTINA, Prov. Chubut, Teka-chorique, Illiín s.n. (I-1900) (LPS 16840 as *P. merdaria*). Prov. Tucuman, Infiernillo, Singer B-3045 (LIL). La Plata, Spegazzini s.n. (1885) (LPS as *P. merdaria*).

CHILE, Valdivia, Sierra Pelada, Singer M-3224 (BAFC, MICH as *P. merdaria*).

CZECHOSLOVAKIA, Kacaku, Herink 587-41 (PR 703997 as *P. merdaria*).

FRANCE, Without locality, Boudier s.n. (1891) (PC as *Stropharia merdaria*).
SWEDEN, Without locality, Lloyd 5107 (37674) (BPI as *P. merdaria*). Pakogodsel, Södermanland, Svärta, Morander 355 (UPS as *P. merdaria*).

DISCUSSION. The type: Guzmán 16664 from U.S.A. (at ENCB with isotypes in MICH and NY) as pointed out by Guzmán (1978a) is provisional, because the original material from Möller was impossible to study (it is not at C, and may be at K; but see a problem in *Materials and methods*). This species differs from *P. merdaria* only in the larger spores (see the key) and by its distribution. The same situation is in *P. cubensis* (Earle) Singer vs. *P. subcubensis* Guzmán and *P. silvatica* (Peck) Sing. & Smith vs. *P. pelliculosa* (Smith) Singer & Smith. Singer (1969) maintained that the varietal status of *P. merdaria* var. *macrospora* cannot be established at present for lack of information on the genetics of these fungi. Only future cultural and genetic studies on *P. merdaria* and *P. moellerii* can establish the exactly taxonomic status of these fungi. *P. merdaria* is more or less common in temperate regions, but *P. moellerii* is in cold-temperate regions. *P. pseudobullacea* (Petch) Pegler, a related species with small spores, grows only in tropics and subtropics. Here the same gradation from smaller to biggest spores (see Guzmán, 1979a) as that observed in the Mexican tropical and temperate species occur. *P. pseudobullacea* has small spores and grows in tropic and subtropic lands, *P. merdaria* has median size spores and grows in temperate lands, and *P. moellerii* has the longer spores and grows on cold lands (see plate 5).

Those fungi reported by Kauffman (1918), Velenovsky (1920), Rea (1922), Murrill (1922) and Kühner & Romagnesi (1953), as *P. merdaria* (as *Geophila*, *Stropharia* or *Psilocybe*) belong to *P. moellerii* on the large spores (13-15 μ m long, 12-17 μ m long, etc.). *P. moellerii* was reported from Chile as *P. merdaria* var. *macrospora* (Möller) Sing. by Lazo (1971). The fungus reported by Menzer (1977) and illustrated in a color plate as *P. coprophila*, is without doubt *P. moellerii* because the studied Menzer's material (Menzer 873) has large spores. *Stropharia merdaria* var. *major* (Fr.) Rea is probably a synonym of *P. moellerii*. According to Rea (1922) this only differs in its much large size of the fruit body and in the ventricose rooting stipe. According to Rea *Stropharia ventricose* Mass. is a synonym of this.

The name of this species is in honor of Dr. F.F. Möller, who first described in 1945 this fungus as *Stropharia merdaria* f. *macrospora* Möller from Faeroes Islands.

SELECTED ILLUSTRATIONS. Möller (1945, fig. 88A); Menzer (1977, fig. 18, as *P. coprophila*).

78. *Psilocybe pseudobullacea* (Petch) Pegler *Kew Bull. Add. Ser. VI*, p. 473, 1977. Figs. 413-420 & Map 2 (Plate 5)

Agaricus bullaceus Fr. sensu Berk. & Br., *Journ. Linn. Soc. Bot.* 11: 555, 1871.
Stropharia pseudobullacea Petch, *Ann. Roy. Bot. Gard. Peradeniya* 9: 128, 1924.

Pileus 5-20 (-35) mm in diam., convex to subumbonate, or slightly papillate in the

adults, somewhat plane or slightly depressed in old specimens, glabrous, even, but slightly striate at the margin when moist, viscid to lubricous, hygrophanous, reddish brown or dark fuscous brown, blackish when moist, dingy chestnut, ochraceous or straw color on drying.

Lamellae broadly adnate to subadnate with a decurrent tooth, fuscous brown or violaceous brown when mature, but with whitish pruinose edges.

Stipe (20-) 25-40 (-55) $\times$ 1-3 (-4) mm, cylindric, equal or slightly expanded at the apex, hollow, glabrescent but at first with brownish scales, surface whitish to pale grey or brownish, striate above, fibrous shaggy below.

Veil well developed, forming a more or less permanent annulus, membranous and white, striate above, subflocose below.

Context whitish to pale brown, pliant. Odor mild or sometimes like hay. Taste mild. KOH stains the pileus and context reddish brown, negative on the stipe (in Guzmán 11709).

Spores (8.2-) 9.3-11 (-12) $\times$ 6.6-8.2 $\times$ 6-7 μ m, subhexagonal in face view, subellipsoid in side view, thick walled, brown, with a broad and plane germ pore.

Basidia (21-) 24-28 (-32) $\times$ 7.5-10 μ m, 4-spored, hyaline, subventricose-clavate, sometimes with a medial constriction.

Pleurocystidia absent or scattered; when present like the cheilocystidia.

Cheilocystidia 20-27 $\times$ 4-8.8 μ m (the New Guinean fungi have cheilocystidia 11-39 μ m long), hyaline, abundant, thin walled, fusoid-ventricose to mucronate or sublageniform, short neck 3.3-4.4 μ m, often with an apical refringent viscid drop.

Subhymenium subcellular, brownish or hyaline, with conspicuous encrusted brown pigment on the hyphal walls, with hyphae 6-8 μ m wide. Trama regular, hyaline or brownish, with slightly encrusted elongated hyphae, 2.5-5 μ m broad. Epicutis formed by a gelatinous pellicular layer of loosely arranged, hyaline, thin walled hyphae, 2-4 μ m in diam. Hypodermium similar to the subhymenium, subcellular and encrusted. Clamp connections present.

HABITAT AND DISTRIBUTION. Gregarious on dung (buffalo, elephant, cow and other animals), in grassland, or on heaps of sugar cane refuse, in subtropical or tropical regions. Known from East Africa, Ceylon, New Guinea, Mexico, Ecuador and Venezuela. Fruiting in summer to early winter.

STUDIED MATERIAL. CEYLON, Sri Lanka, Peradeniya, *Twaites 838 (cum icon.)* (K Type) (*no vidi*)*

MEXICO, State of Jalisco, Ingenio de Tamazula, Guzmán 11709 (ENCB). State of Veracruz, Ingenio de Tres Valles, Guzmán 17972 (ENCB; NY).

ECUADOR, 22 km from Zamora, road to Loja, Dumont EC-1920 (NY as *P. panaeoliformis*).

*Only the iconograph was studied, as well Petch's (1924) description.

VENEZUELA, Norther Merida, San Javier del Valle, Guzmán 9171 (ENCB).

NEW GUINEA, Papua, Woitape, Yokoyama 2096; 2097 & 2098 (TNS; ENCB) (all as *P. paneoliformis*).

DISCUSSION. This species is very close to *P. merdaria* (Fr.) Ricken from which it differs in the size of the spores (see key). The Mexican and Venezuelan material studied here is identified with Petch's species following Pegler's description (1977). The African and Ceylon fungi reported by Pegler (1977) agree well with the American specimens. These Mexican and Venezuelan fungi were first (Guzmán *et al.*, 1977; Guzmán 1978a) identified as *P. merdaria*, but the smaller spores amply distinguish these from *P. merdaria*. The fungi described by Yokoyama (1979) from New Guinea and Guzmán (1978a) from Ecuador, both as *P. panaeoliformis* belong to *P. pseudobullacea* because of the well developed annulus.

This fungus was first described by Berkeley & Broome (1871) as *Agaricus (Psilocybe) bullaceus* Bull. from Ceylon (Sri Lanka, Peradeniya), based in a collection made by Thwaites 838 even with a color iconograph (both are the type of *P. pseudobullacea* at K). Petch (1924) considered this fungus as *Stropharia pseudobullacea* Petch, but he described spores $11-15 \times 7-9 \mu\text{m}$, which as Pegler (1977) stated, are not in Petch's type material; Pegler reported the spores in this species as $8.5-12 \times 6-8.5 \mu\text{m}$.

P. pseudobullacea seems a gondwanian fungus, because of its austral distribution. It is probably that *P. pseudobullacea* had its origin in the Gondwana Land and it is very interesting to see here another relationship between Africa and the tropical America like those found with the vascular plants (Van Steenis, 1962), and even with fungi (see Guzmán, 1970 in *Scleroderma* and 1974 in the genus *Fistulinella* Henn., this latter described from Africa and then found in the tropics of Mexico.).

The name of the species means that it is like *P. bullacea*, from which differs in the size of the spores.

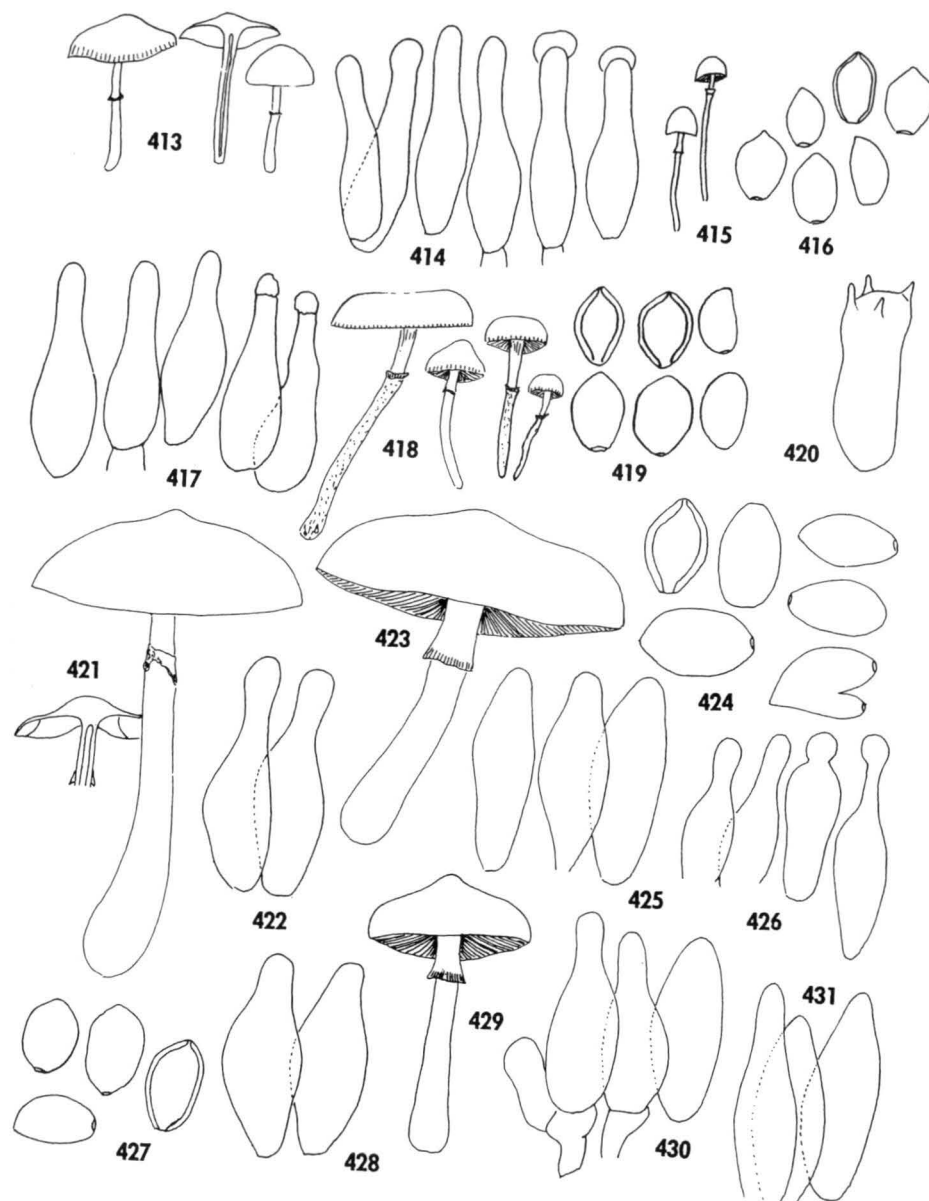


Plate 30: Figs. 413-431. - Several species of *Psilocybe*. 413-420: *P. pseudobullacea*, 413: Carpophores, 414: Cheilocystidia, 415: Carpophores, 416: Spores, 417: Cheilocystidia, 418: Carpophores, 419: Spores, 420: Basidium (413: Thwaites 838; 414-416 & 420: Guzmán 9171; 418-419: Guzmán 11709). 421-426: *P. cubensis*, 421: Carpophores, 422: Cheilocystidia, 423: Carpophore, 424: Spores, 425: Pleurocystidia, 426: Cheilocystidia, (421-422: type; 423-426: type of *Stropharia cyanesceus*). 427-429: *P. subcubensis*, 427: Spores, 428: Pleurocystidia, 429: Carpophore (all from the type). 430-431: *P. collybioides*, 430: Cheilocystidia, 431: Pleurocystidia (all from the type).

Stropharia anellariiformis Murr., sensu Smith, *Mycologia* 31: 555, 1939.

A *psilocybe anellariiformis* differt in sporis angustus 6-7.5 μ m in diametro. Typus: Smith 33571 (MICH), ad fimus, Ann. Arbor, Michigan (U.S.A.).

Pileus 10-30 mm diam., conic to convex, subumbonate or campanulate, finally plane, glabrous, except for the veil fibrils near the margin, viscid, margin faintly striatule when moist, hygrophanous, brownish orange or brown, fading to buff brown or ochraceous.

Lamellae bluntly adnate with a decurrent tooth, pallid to dull brown when young, finally becoming dark purple-brown, with whitish and even edges.

Stipe 30-80 $\times$ 1-4 mm, hollow, pallid tawny or pale brownish, rather coarsely pruinose above the annulus, and covered by fibrill patches below, which give it a whitish appearance in young stages; with a pseudorhiza up 30-40 mm long.

Veil well developed. Annulus median or superior, whitish, membranous, permanent to sometimes evanescent.

Context thickish at pileus, pallid, with odor and taste not distinctive.

Spores 9-12 $\times$ 7-7.5 μ m, subhexagonal in face view, subellipsoid in side view, brownish, thick walled, with a broad germ pore.

Basidia not studied.

Pleurocystidia absent.

Cheilocystidia 25-30 $\times$ 6-12 μ m, hyaline, not abundant, sublageniform to clavate.

Cuticle consisting of a thick pellicle of hyaline gelatinous hyphae. Hypodermium of hyphae pigmented yellow brown, somewhat encrusted.

HABITAT AND DISTRIBUTION. Scattered on horse dung. Fruiting in July. Known only from the type locality.

STUDIED MATERIAL. U.S.A., Michigan, Ann Arbor, Smith 33571 (Type MICH, as *Stropharia "anellariiformis"* Murr.).

DISCUSSION. The herbarium material was not studied microscopically by the author but the described species is considered a good taxon for its microscopic and macroscopic features described by Smith (1939). *P. subanellariiformis* Guzmán differs from *P. anellariiformis* (Murr.) Sing. in the broad spores (7-) 8.4-9.6 (-10.5) μ m in *P. anellariiformis*). The position of the lamellae and the pseudorhiza, as well as the habitat, seem to be the same in both species. Smith (1939) reported this species from Michigan and says that his specimens differs from Murrill's species in the hollow stipe, the striate margin of the pileus, the lamellae not being truly decurrent, and in the presence of a well differentiated pseudorhiza. But as he stated, these are not features of taxonomic value. He did not mention the difference between the spores. Murrill (1922) reported spores 7-8 μ m diam.

SELECTED ILLUSTRATIONS. Smith (1939, fig. 6).

Section Cubensae Guzmán, sect. nov.

Species fimicolae vel subfimicolae, sporis subhexagonoideus crassitunicatis. Cum annulus. Carpophoris caerulescentibus. Typus *P. cubensis* (Earle) Sing.

Coprophilus or subcoprophilus bluing species, with subhexagonal thick walled (0.5-1 μ m) spores. Annulus well developed.

Species considered: 80. *P. cubensis* (Earle) Sing. and 81. *P. subcubensis* Guzmán.

Key to species

- 1a. Spores (12-) 13.2-15.4 (-17.6) μ m long. Subtropical species. 80. *P. cubensis*
 1b. Spores (9.9-) 11-13 (-14) μ m long. Tropical and subtropical species. 81. *P. subcubensis*

80. *Psilocybe cubensis* (Earle) Sing. *Sydowia* 2: 37, 1948.

Figs. 421-426, 635-639, 706 & 745

Stropharia cubensis Earle, *Est. Agron. Cuba* 1: 240, 1906.

Naematoloma caerulescens Pat., *Bull. Soc. Myc. Fr.* 23: 78, 1907.

Stropharia subcyanescens Rick, *Broteria* 24: 114, 1930.

S. caerulescens (Pat.) Sing., *Ann. Mycol.* 34: 340, 1936.

S. cyanescens Murr., *Mycologia* 33: 279, 1941.

Hypholoma caerulescens (Pat.) Sacc. & Trott., *Syll. Fung.* 21: 212, 1912.

Psilocybe cubensis var. *cyanescens* (Murr.) Sing. & Smith, *Mycologia* 50: 269, 1958.

P. cubensis var. *caerulescens* (Pat.) Sing & Smith, *Mycologia* 50: 269, 1958.

Pileus (15-) 25-70 (-85) mm in diam., conic to convex, becoming campanulate to gradually expanded-umbonate, sometimes when mature frequently with a depression around the umbo, viscid, glabrous or with white fugacious spots, remnants from the veil near the margin, but margin even, entire, not appendiculate; hygrophanous, surface uniformly fulvous when young, changing to ochraceous and cremous or whitish in older fungi, frequently bluing in age or when injured.

Lamellae adnate or adnexed to sometimes seceding, at first dark grayish, becoming deep violet gray or dark purplish brown, and somewhat mottled, finally blackish violet, but with whitish and subflocose edges.

Stipe (40-) 70-120 (-170) $\times$ (4-) 8-13 (-16) mm, equal or subbulbous, hollow or somewhat stuffed, surface white to creamous or yellow brown when faded, easily staining blue when injured, fibrillose but smooth or slightly squamulosa below the annulus, strongly sulcate at the apex. In dry specimens, blackish tones are common.

Veil well developed, forming a membranous and persistent, fragile white annulus; soon becoming concolorous with the gills on the upper surface by the spores; smooth or somewhat sulcate above.

Context white, thick, easily staining blue when cut or injured. Odor and taste strongly farinaceous, especially in young specimens.

Spore print blackish violet.

Spores (12-) 13.2-15.4 (-17.6) $\times$ 7.7-9.9 (-11) $\times$ 7-8.8 μ m (sometimes up to 19 μ m long), subhexagonal in face view, subellipsoid in side view, thick walled (1 μ m) dark yellowish brown, with a truncate apex because of a distinct and broad apical pore, sometimes abnormal spores are present, with two germ pore.

Basidia 24-35 $\times$ 10-13 μ m, 4-spored, rarely 2- or 3-spored, hyaline, ventricose to subcylindric with a median constriction.

Pleurocystidia 18-30 $\times$ 6-13 μ m, scattered, thin walled, hyaline, ventricose, or subpyriform, or sometimes with acute apex, or submucronate with the apex obtuse to rounded.

Cheilocystidia 17-32 $\times$ 6-10 μ m, abundant, forming a sterile band, hyaline, thin walled, fusoid-ventricose with obtuse to subcapitate apex, or mucronate, sometimes sublageniform with long simple neck 4-18 μ m long, 3-5 μ m thick, but occasionally irregularly branched.

Subhymenium subcellular, with brownish pigment more or less incrusting on the walls of elongated to subglobose hyphae cells. Trama parallel, with elongated hyphae up to 3 μ m thick, hyaline to somewhat brownish yellow pigmented. Epicutis formed by a thin gelatinous layer of narrow hyaline to yellowish hyphae, 7-13 μ m diam., which are radially arranged. Hypodermium formed by interwoven elongated, brownish or ochraceous hyphae, up to 26 μ m. Clamp connections common.

HABITAT AND DISTRIBUTION. Gregarious, rarely solitary or scattered, on cow (rarely on horse) dung, sometimes on rich pasture soils, every time in sunny places. Fruiting in Summer, but also infrequent in other seasons. Common in subtropical regions, unknown in the tropics. Known in Florida and Texas (U.S.A.), Cuba, Mexico, Guatemala, South America, Vietnam and Australia. The record from British Honduras by Singer & Smith (1958b), based in Peck's collection in NY, was not checked by the author (maybe it belongs to *P. subcubensis* Guzmán).

STUDIED MATERIAL. U.S.A., Florida, Alachua County, Gainesville, Murrill F-16209 (NY Type of *Stropharia cyanescens*; Isotypes in BPI, FLAS, FH & MICH); between Micanopy and Gainesville, Payne's prairie, Singer 1802 & 1802-A (FH). Near Tampa, Guzmán 16765 (ENCB). Manatee County, Myakka Valley Ranch, Kits s.n. (31-4-1964) (L). Texas, College Station, Menser 722 (ENCB). Houston, Jackson & Chandler s.n. (Dec. 22, 1975) (ENCB).

CUBA, Santiago de las Vegas, Earle 169; 240; 315 & 350 (all in NY); 109 (Type NY). Candelaria, Earle 206 (NY). Soledad-Cienfuegos, White 526 & 808 (FH).

MEXICO, State of Chiapas, Lagos de Montebello, Guzmán 10483 (ENCB). State of Jalisco, near Guadalajara, Barranca Cola de Caballo, Ventura s.n. (Sept. 30, 1969) (MICH). State of Puebla, Necaxa, Guzmán 2417 (ENCB). State of Oaxaca, Huautla de Jiménez, Schultes & Reko 349 (FH); Singer 1512 (MICH). Morlan 35-76

(ENCB); Leslie 1902 (ENCB); Guzmán 1883 & 1884 (ENCB). Mije zone, San Juan Mazatlán, Lipp 14 (ENCB). Coatzacoalcos to Tehuantepec, 5 km northeastern Matías Romero, Guzmán 15719 & 16058 (ENCB). State of Hidalgo, Xochicoatlán, Dueñas s.n. (Febr. 4, 1980) (ENCB). State of Veracruz, Municipio Totutla, Encinar, Ventura 7056; 8392 & 8572 (ENCB). San Andrés Tlanahuayucan, Ventura 13304 (ENCB). Tlapacoyan, Ventura 738 (ENCB). Region of Xalapa, Jacobs 69 (ENCB). Huatusco, Ortega et al. (MEXU 1836); Pollock 7/23/78-2 & 7/23/78-5 (ENCB). Orizaba, Martínez (Jul. 14, 1973) (ENCB). Northeastern Minatitlán, Sotepapa, Guzmán 17431 (ENCB). State of Zacatecas, Southeastern Monte Escobedo, Acosta 449 (ENCB).

GUATEMALA, Locality unknown (sell by the Indians), Ott 75-20 (ENCB).

COLOMBIA, Dept. Cundinamarca, road to Bogotá, near La Mesa, Pulido 162 (COL; ENCB). Mpio. San Francisco, autopista Medellín, Vereda Sabaneta, Pulido 54 (COL; ENCB).

BOLIVIA, Dept. La Paz, Prov. Nor-Yungas, Coroico, Singer B-878 & B-1083 (BAFC). Río Santa Barbara, Singer B-1289 (BAFC). Dept. Beni, Prov. Vaca de Diez, Guayamerín, Singer B-1964 & B-17763 (BAFC).

BRAZIL, Rio Grande do Sul, Itacolomi, Gravataí, Guzmán 8828 (ENCB). Santa Maria, Rick 9376 (FH, PACA 15227, neotype of *Stropharia subcyanescens* Rick) (see Singer, 1953). São Leopoldo, Rick 1931 (FH).

ARGENTINA, Estancia San Ramón, Vera s.n. (8-IX-63) (BAFC). Corrientes, Curuzu Cuatía, Singer S-566 (BAFC). Tucumán, Singer & Sparre T-98 (LIL). Prov. Buenos Aires, Punta Lara, Singer S-192 (BAFC).

VIETNAM, Hanoi, Demage s.n. (Lloyd Herb. 5058 & 43192) (one specimen (BPI as *Panaeolus* sp.); Patouillard s.n. (Type of *Naematoloma caeruleum* FH).

AUSTRALIA, Queensland, Indooroopilly, Watling 10768 & 10823 (E).

DISCUSSION. The varieties described by Singer & Smith (1958b) are not recognized here because they are merely variation of the color of the pileus caused by the age of the sporophore. This observation is based on the studied of several specimens, collected by the author in different conditions, as well as on the study of the type (Earle 109) and on the original description (Earle, 1906), and on the study of the types and original descriptions of the synonyms taxa (Patouillard, 1907; Rick, 1961*; Murrill, 1941). This species was somewhat confused by Singer & Smith (1958b) and Heim & Wasson (1958) with *P. subcubensis* Guzmán. *P. cubensis* is one of the common hallucinogenic fungi used in Mexico, South America and U.S.A. (together with *P. subcubensis*) (Llorca Izquierdo, 1972; Oss & Oeric, 1976; Pollock, 1977; Ott, 1976, and Ott & Bigwood, 1978).

Concerning to the distribution and taking in consideration that this fungus only grows on cow or horse dung, it was surely introduced to America by the Spanish

*Rick in this publication presented a re-description of his species described in 1930.

through the cattle from Africa. The most popular name of this fungus among the Mazatec Indians (Huautila de Jiménez region, at Mexico) is "San Isidro", in honor of a Spanish saint. It is interesting to observe that there are no records of *P. cubensis* from Africa. Heim & Wasson (1958) supposed the presence of this species in Africa (Nairobi and Kenya), based on the poisoning records by Cullinan *et al.* (1945) and Charters (*Trans. Royal Soc. Trop. Med. & Hygiene* 51: 265, 1957). Pegler & Rayner (1969) and Pegler (1977) stated that the fungus reported by Cullinan *et al.* (1945) is *P. merdaria* (Fr.) Ricken, but this does not seem to be hallucinogenic nor affect the central nervous system, and the Cullinan's fungus produces effects on the nervous system. On the other hand, *Stropharia aquamarina* Pegler described from Africa (Pegler 1977) may be it the same that *P. subcubensis* Guzmán; Pegler described a fungus with spores 8.5-12 μm long, cheilocystidia 22-33 $\times$ 7.5-11 μm , and no pleurocystidia.

P. cubensis was first reported by Singer (1949) from Mexico, based on Schultes and Reko's material collected in Huautila de Jiménez, State of Oaxaca. Singer wrote (pag. 506) in the practical importance of the genus *Psilocybe*: "At least one species is used as a drug in Mexico (causing a temporary narcotic state hilarity) but is poisonous when used in excess". Singer took this information from the material deposited in FH and in Schultes (1939). On pag. 472, Singer (*op. cit.*) wrote that *P. cubensis*, as well as *Panaeolus sphinctrinus* and *P. pabonaceus*, are used as intoxicating drug in Central America. Unfortunately, the material of Schultes and Reko identified by Singer as *P. cubensis*, was first confused by him with *Stropharia caerulescens* Imai and *S. caerulescens* (Pat.) Sing. (see Fig. 43 in Heim & Wasson, 1958). Heim (1956b), Heim & Wasson (1958), Singer & Smith (1958b) and Guzmán (1959) reported this fungus as an important hallucinogenic species in Huautila de Jiménez. Singer (1960a) reported *P. cubensis* from Argentina. Dennis (1970) reported it from Trinidad and Bolivia, Kreisel (1971) reported it from Cuba, and Southcott (1974), Hall (1973) and Guzmán & Watling (1978) from Australia. Morgan (1908) reported *P. cubensis* (as *Stropharia*) from Cuba, following Earle's report (1906). Stevenson (1975) reported this fungus from Puerto Rico. Jackson & Alexopoulos (1976) reported *P. cubensis* from Texas in a comparative study between the populations of U.S.A. and Mexico (Palenque, State of Chiapas), but they did not study the microscopic features; the studied material from Mexico surely belongs to *P. subcubensis* Guzmán.

Heim & Hofmann (1958 a & b) isolated psilocybine from cultures of *P. cubensis*. Chaves de La Mora (1961), following Hofmann's method, isolated psilocybin from Mexican material obtained from cultures by Zenteno & Herrera (1958). Chaves de la Mora (*op. cit.*) also found that *P. cubensis* has antibiotic effects on *Cryptococcus neoformans* but not on *Bacillus subtilis*, *Staphylococcus aureus*, *Escherichia coli*, *Saccharomyces caribajali* and *S. cerevisiae*. Repke *et al.* (1977) made a spectral analysis of psilocybin and psilocin of *P. cubensis*. Heim & Cailleux (1957) and Heim & Wasson (1958) obtained cultures of *P. cubensis*. They found acromoniform and vesiculose hyphae cells, arthrospores and many clamp connections in the cultures. The fruit bodies obtained generally were more robust with longer stipe than wild types; they also obtained sterile fruit bodies with whitish gills. In Mexico

Zenteno & Herrera (1958), Ulloa & Herrera (1967) and Olmos-Fuentes & Herrera (1973) studied effects of ecological and chemical conditions on the cultures of this fungus. *P. cubensis* is one of the easiest species to get into culture. Many popular books in U.S.A. give information how to get cultures of this fungus. Semerdzieva & Musilek (1976) reported *P. cubensis* in the culture collection at their Czechoslovakian Institute.

Melendez-Howdell (1967) studied the wall of the spores. Morgan-Jones & Gray (1979) described *Mycogone psilocybina* Morgan-Jones & Gray, isolated from wild carpophores of *P. cubensis* collected in Alabama, U.S.A. They found that *M. psilocybina* has adverse effects on the growth and sporulation of *P. cubensis*. Stamets (*pers. com.*) observed very thick clamp connections, bottle shaped pleurocystidia with rouns apices, and cheilocystidia with very long filamentous necks. This features has not been reported before and may have taxonomic importance (see figs. 635-639).

SELECTED ILLUSTRATIONS. Heim & Wasson (1958, pl. XIX, pl. XX (figs. 3-9) and pl. XXXIV); Guzmán (1978d, p. 115); Stamets (1978, figs. 15-17); Ott (1976, pls. 20-23) and Ott & Bigwood (1978, figs. 25 & 29).

81. *Psilocybe subcubensis* Guzmán *Mycotaxon* 7: 248, 1978.

Figs. 427-429, 682-684, 706 & 744

Pileus (10-) 18-50 (-70) mm in diam., conic to convex or convex campanulate to subumbonate, subviscid, glabrous, or with white spots from the veil near the margin when young but margin not appendiculate; surface even or slightly striate when moist, hygrophanous, brownish red or mustard color to brownish yellow or beige towards the margin or silvery when dry. Readily bluing when fresh and young.

Lamellae adnate or sinuate-adnate or in dry specimens seceding, grayish violet to dark violet brown or almost black-violet, with whitish subfloccose edges.

Stipe (30-) 50-80 (-100) $\times$ (3-) 4-6 (-10) mm, equal or slightly bulbous, hollow, white to pale yellowish, easily bluing to blackish when injured, smooth and silky above, fibrillose or subfloccose.

Veil well developed as a white thick membrane, that soon forms a persistent but fragile annulus, with sulcate above, even below; margin somewhat floccose.

Context white in the pileus or yellowish in the stipe, easily bluing when cut or injured. Odor and taste strong farinaceous. KOH stains the pileus and stipe pinkish. Negative on the stipe.

Spore print dark brownish violet or blackish violet.

Spores (9.9-) 11-13 (-14) $\times$ 7.7-8.8 $\times$ 6.6-7.1 μm , subhexagonal in face view, subellipsoid in side view, thick walled (0.5-1 μm), dark yellowish brown, with a plane and broad apical germ pore.

Basidia 20-32 $\times$ 9-11 μ m, 4-spored, few are 2-spored, hyaline, vesiculose-subcylindric or subpyriform.

Pleurocystidia 14-22 $\times$ 8-12 μ m, hyaline, scarce, thin walled, ventricose or subpyriform, submucronate.

Cheilocystidia 16-25 (-36) $\times$ 6-9 μ m, hyaline, abundant, forming a sterile band, thin walled, fusoid-ventricose or sublageniform, with short neck, sometimes with subglobose heads, 3.5-5.5 μ m diam.

Subhymenium formed by elongated to subglobose elements, hyaline or with some incrusting yellowish-brown pigment on the walls. Trama regular, hyaline to brownish yellow. Epicutis as a thin subgelatinous layer of narrow hyaline hyphae, up to 10 μ m diam. Hypodermium formed by interwoven elongated brownish yellowish to hyaline hyphae, up to 28 μ m diam. Clamp connections common.

HABITAT AND DISTRIBUTION. Scattered or gregarious on cow (rare on horse) dung, more rare in rich soil, in grassy sunny places (pastures). It is a pantropical and subtropical species. Fruiting in summer but also in other seasons (as for most fimicolous fungi).

STUDIED MATERIAL. U.S.A., California, San Francisco, cultures (unknown origin, probably tropical places of Mexico), made by Billeci and then by Duncan, registered by Vergeer 2179 & 2180 (Vergeer Herb. & ENCB).

MEXICO, State of Chiapas, Palenque, Johnson 1973-05-2250 (ENCB; TRTC as *P. cubensis*). State of Jalisco, 11 km NE of Tamazula, Galindo s.n. (Aug. 11, 1974) (Type ENCB). State of Michoacan, Morelia (Zoo Park), Guzmán 18178 (ENCB). State of Oaxaca, Xolotla Atla, Stresser-Pean s.n. (Sept. 1976) (PC). San Agustín Loxicha, Guzmán 1505 & 1861 (ENCB). Tuxtepec to Ojitlan, Piedra Quemada, Guzmán 16145 (ENCB). Chiltepec, Guzmán 2768 (ENCB). Huautla de Jiménez region, Wasson 3 (PC as *P. caerulescens* var. *mazatecorum*); Wasson s.n. (Aug. 13, 1953) (NY as *P. caerulescens* var. *mazatecorum*); San Jerónimo, Guzmán 957 (ENCB); Rancho El Cura, Guzmán 916; 1495 & 1880 (ENCB); Puente Fierro, Morlan 9-76 (ENCB), Guzmán C-29; 870; 871; 874 & 875 (all obtained by culture in ENCB from Guzmán 957). Near Totontepec, Jacobs 62 (ENCB). Cultures at Paris, Heim 8-14-56 (PC as *Stropharia cubensis*). Northeastern Matías Romero, road to Coatzacoalcas, Guzmán 17605; 17608 & 17620 (ENCB); Pollock 11-20-78-1 (Culture from Guzmán 17605) (ENCB). State of Puebla, Necaxa, Ursua s.n. (Jul. 23, 1960) (ENCB); Guzmán 2117 & 2180 (ENCB). State of Veracruz, Coscomatepec to Huatusco, La Raya, Guzmán 16326 & 16328 (ENCB), Pollock 7/23/78-6; 7/27/78-2 & 7/29/78-2 (ENCB). Southwestern Minatitlán, Ejido El Jagüey, Pérez-Ortiz 1184 & 1178 (ENCB). Misantla region, Puerto Buenos Aires, Jacobs 31 (ENCB). Los Tuxtlas region, 3 km South Montepio, Guzmán 7234 (ENCB); 17148 (ENCB; NY); Levy 002 (ENCB). Xalapa region, López 4 (ENCB; Herb. Univ. Veracruz); Pollock 76 (ENCB); Ventura 10021; 10172 & 10174 (ENCB). Alvarado to Lerdo de Tejada road, Guzmán 17036 (ENCB).

COLOMBIA, Dept. of Boyaca, Choconta-Aguaclara; Dumont CO-4775 & CO-4855-A (NY as *P. cubensis*); Dept. of Santander, Puerto Wilches, between Gómez and km 80 road the Atlantic, Romero 8361 (COL).

BOLIVIA, Dept. Beni, Prov. Vaca de Diez, Guayaramerin, Singer B-2036 (BAFC; MICH; both as *P. cubensis*).

ECUADOR, road to Mendez, near Limón Dumont EC-2060 (NY as *P. cubensis*).

HONDURAS, La MOSQUITIA, Guampusirpe, Guzmán 374 (ENCB). Ahuas, Guzmán 382-A (ENCB). (Reported as 328-A in Mycotaxon 7: 248, 1978 by mistake).

EL SALVADOR, Dept. de Sonsonate, road to Acajutla, Toledo s.n. (Jun. 1975) (ENCB).

VENEZUELA, Northern Mérida, San Javier del Valle, Guzmán 9165; 9182 & 9183 (ENCB).

AUSTRALIA, Queensland, Breban, Watling 10316 (E); near Loboutluse, Watling 10778 (E).

DISCUSSION. This is a hallucinogenic fungus often mistaken for *P. cubensis* (Earle) Sing. All the macroscopic features seem more or less the same in both species, but the smaller spores separated well *P. subcubensis* from *P. cubensis* (see the key to species). The pleurocystidia seem smaller in *P. subcubensis*. Information on the chemistry, cultures and uses of *P. subcubensis* are as those in *P. cubensis* because several studies reported as that species were probably on *P. subcubensis* specimens, since both species are so similar.

SELECTED ILLUSTRATIONS. Stamets (1978, fig. 24) (this figure is the material Vergeer 2179 or 2180 from U.S.A.).

Section *Zapotecorum* Guzmán, sect. nov.

Sporis tenuitunicatis, subellipsoideis vel subfusiformis vel subrhomboideis. Pleurocystidiis hyalinis vel spadiceis vel nullis. Typus: *P. zapotecorum* Heim emend. Guzmán.

Thin walled (nor more than 0.5 μm thick) subellipsoid, subrhomboid or subfusiform spores. Pleurocystidia hyaline or somewhat brownish, or they are absent. Subtropical or temperate widespread species.

This Section differs from Sect. *Brunneocystidiatae* by the thin walled spores.

Species considered in this section are: 82. *P. angustipleurocystidiata* Guzmán, 83. *P. argentipes* Yokoyama, 84. *P. collybioides* Sing. & Smith, 85. *P. graveolens* Peck, 86. *P. kumaenorum* Heim, 87. *P. muliercula* Sing. & Smith, 88. *P. pintonii* Guzmán, 89. *P. subcaerulipes* Hongo and 90. *P. zapotecorum* Heim emend. Guzmán.*

Key to species

- 1a. Pleurocystidia hyaline or frequently brownish at least in the base. 2
- 1b. Pleurocystidia absent. 5
- 2a. Spores (7-) 7.5-10 (-12) μm long. Species known only from New Jersey (U.S.A.) 85. *P. graveolens*
- 2b. Spores smaller than in above choice. 3
- 3a. Cheilocystidia 5.5-11 μm diam. Species known only from Tucuman (Argentina) 84. *P. collybioides*
- 3b. Cheilocystidia 3.5-8 μm diam. 4
- 4a. Pleurocystidia 19.8-38 $\times$ 5.5-14 μm 90. *P. zapotecorum*
- 4b. Pleurocystidia (9-) 10.8-15.5 (-20) $\times$ 3.1-6 μm 82. *P. angustipleurocystidiata*
- 5a. Cheilocystidia frequently and irregularly branched; when branched they are not lageniform 6
- 5b. Cheilocystidia simple, not branched (except few cases in *P. muliercula*, see No. 8 of this key). Mostly uniformly lageniform. 7
- 6a. Cheilocystidia ventricose-fusoid with capitate or subcapitate apex, 3-5 μm broad and irregularly branched; others are lageniform; without lateral outgrowths. Stipe without pseudorhiza. Species known only from the high cold mountains ("páramos") of Colombia. 81. *P. pintonii*
- 6b. Cheilocystidia ventricose-ampullaceous, mucronate or with a narrow neck, frequently branched or with two or three necks, or with lateral outgrowths. Stipe with pseudorhiza. Species known only from Japan. 83. *P. argentipes*
- 7a. With small cheilocystidia, 11-17 $\times$ 3.3-5 μm . Species known only from New Guinea. 86. *P. kumaenorum*

*Recently Guzmán in *Bol. Soc. Mex. Mic.*, Vols. 16(1981) and 17(1982) described two new species from Mexico.

- 7b. With large cheilocystidia, 15-22 μm long. 8
- 8a. Spores (6-) 7-8 (-9.9) $\times$ 3.8-5 μm . Cheilocystidia 3.8-5 (-6) broad. Species known only from high mountains with coniferous forest in Mexico. 87. *P. muliercula*
- 8b. Spores (5.5-) 6-6.6 (-7.5) $\times$ 3.8-4.4 (-5.5) μm . Cheilocystidia 5-7 μm broad. Species known only from Japan. 89. *P. subcaerulipes*

82. *Psilocybe angustipleurocystidiata* Guzmán sp. nov.

Pileus 15-35 mm latus, conicus demum convexus subumbonatus, glaber, subviscidus, hygrophanus, rufobrunneus vel flavido brunneus. Lamellae subadnate, pallidae demum brunnae. Stipe 30-50 $\times$ 5-8 mm, pallide griseo-fibrillosa vel rufobrunneus. Carne caerulescente. Sporis (5.2-) 6.5-7.8 (-9.1) $\times$ 3.2-3.9 (-5.2) $\times$ 3.2-3.9 μm , subellipsoideis, spadiceis, tenuitunicatis. Pleurocystidiis (9-) 10.8-15.5 (-20) $\times$ 3.1-6.5 μm , hyalinis, ventricosus-rostratus vel sublageniformis. Cheilocystidiis (10.4-) 13-24 $\times$ (2.6-) 5.2-6.5 (-7.8) μm , hyalinis, ventricosus-rostratus vel sublageniform. Cuticula pileorum subgelatinosa. Hyphae fibulatae. Gregariis ad terram. Typus: Mora 186 (ENCB), Prope Hueyapan, Morelos (Mexico).

Pileus 15-35 mm in diam., conic to convex but subumbonate or subcampanulate, glabrous, even to slightly sulcate in dry, subviscid, hygrophanous, reddish brown, fading to fulvous brown or yellowish with dark blue green tints. Sometimes the dry specimens remain blackish.

Lamellae subadnate, pale brownish to dark violaceous brown, with the edges concolorous or slightly whitish.

Stipe 30-50 $\times$ 5-8 μm , equal or enlarged downwards, longitudinally striate, fibrous, flexuous, hollow, floccose above, brownish to reddish brown, finally remain blackish. Bluening when touched or injured.

Veil poorly developed, as whitish flocculent fibrils in the young stages, soon evanescent.

Context whitish to pale brownish to concolorous with surface. Odor and taste farinaceous. Staining blue when cut.

Spores (5.2-) 6.5-7.8 (-9.1) $\times$ 3.2-3.9 (-5.2) $\times$ 3.2-3.9 μm , subellipsoid both in face and side view, thin walled and brownish, with a narrow plane apical germ pore.

Basidia 15.6-26.6 $\times$ 3.9-6.5 μm , 4-spored, ventricose, hyaline.

Pleurocystidia (9-) 10.8-15.5 (-20) $\times$ 3.1-6.5 μm , hyaline, scarce, ventricose-rostrate to sublageniform.

Cheilocystidia (10.4-) 13-24 $\times$ (2.6-) 5.2-6.5 (-7.8) μm , hyaline, abundant, forming a sterile band, ventricose-rostrate to sublageniform.

Subhymenium subcellular, hyaline to brownish with small globose elements not incrustated, but frequently with a blue pigment seen in KOH solution. Trama of the gill regular, hyaline to brownish. Epicutis as a subgelatinous hyaline thin layer of narrow and parallel hyphae. Hypodermium with hyaline to brownish hyphae or with small globose elements, 4-20 μm diam. Clamp connections present.

HABITAT AND DISTRIBUTION. Gregarious to caespitose on soil, frequently muddy soil without herbaceous plants, usually in ravin, in subtropical regions. Known only in Mexico and Colombia. Fruiting in Summer.

STUDIED MATERIAL. MEXICO. State of Morelos, Municipio of Tetela del Volcan, Hueyapan, *Mora 186* (Type, ENCB; Isotypes NY and Herb. Univ. Morelos).

COLOMBIA, Dept. Magdalena, Sierra Nevada de Santa Marta, San Lorenzo, near Estación Inderena, *Pulido 268* (COL; ENCB).

DISCUSSION. This species is very close to *P. zapotecorum* Heim emend. Guzmán, but differs in the size of the pleurocystidia ($19.8-38 \times 5.5-14 \mu\text{m}$ in that species). It is also close to *P. muliercula* Sing. & Smith, but that species has not pleurocystidia and grows in temperate forests. *P. angustipleurocystidiata* is an hallucinogenic fungus (as all the bluing species in the genus with farinaceous taste and odor). The indians of the type locality use the fungus for to avoid stomach pains or molar teeth pains or for to see visions, however, De Avila *et al.* (1980) did not mention this fungus; it seems very rare in Hueyapan. It is probably that some collections registered as *P. zapotecorum* in the Studied material really belong to *P. angustipleurocystidiata*. Both species grown in the same habitat and regions.

The name of the species refers to the narrow pleurocystidia.

83. *Psilocybe argentipes* Yokoyama *Trans. Myc. Soc. Jap.* 17: 349, 1976.

Figs. 432-435, 735-736 & 738

Pileus 20-50 (-60) mm in diam., conic-campanulate then subconvex or expanded, umbonate or subpapillate, margin often irregularly wavy, inflexed when young, and with appendiculate particules of the veil, surface glabrous, margin sometimes translucent-striate, not viscid, hygrophanous, when moist honey yellow, golden brown, mustard brown or clay color to subfuscous, fading to melleous or ochraceous when dry, staining blue to blackish when touched.

Lamellae adnate or adnexed, soon seceding, greyish sepia or brownish orange to grayish avellaneous, becoming purple brown when mature, edges whitish.

Stipe 60-80 $\times$ 2-4 mm, somewhat thickened downward, or almost equal, somewhat rigid and cartilagenous, hollow, whitish to amber yellow when young, then brownish, finally dark brown or reddish brown, densely covered with appressed, silvery white fibrils in the lower two thirds of the stipe, bluing where injured or handles. Basal mycelium sometimes strigose, white, and forming white rhizomorphs.

Veil well developed as white arachnoid fibrils, forming a silvery white scaly-membranous subannulus, but very often evanescent.

Context yellowish brown when wet, pale yellow or light gray when dry. Odor slightly unpleasant, taste none or sometimes bitter when fresh; not distinctive in dried specimens.

Spores (5-) $6.6-7.7$ (-8.5) $\times$ $3.8-4.4 \times 3.3-3.8 \mu\text{m}$, subellipsoid both in face and side view, or slightly inequilateral in side view, thin walled (0.5-1 μm), pale yellowish brown, with a distinct plane and apical germ pore.

Basidia 16-18 $\times$ 5-6 μm , 4-spored, hyaline, clavate, sterigmata 3-4 $\times$ 1 μm .

Pleurocystidia absent.

Cheilocystidia 13-25 (-32) $\times$ 5-8 μm , abundant, hyaline, thin walled, varying in form, ventricose-ampullaceous, mucronate or with narrow (1.5-2 μm) neck, frequently irregularly branched, or with two or three necks, or with lateral outgrowths.

Subhymenium subcellular with subglobose and elongated elements, brownish yellow with diffused pigment or somewhat incrustated on the walls. Trama parallel, hyaline or yellowish brown. Epicutis of thin subgelatinous layer with hyaline narrow hyphae. Clamp connections present.

HABITAT AND DISTRIBUTION. Gregarious or fasciculose on soil in open areas or by the trails in forest of *Cryptomeria japonica* mixed with *Quercus glauca*, or in plantations of *Pinus taeda*. Known only from Japan. Fruiting between June-September.

STUDIED MATERIAL. JAPAN, Kimimakibara, Daisen-cho, Saihaku-gun, *Tanigushi EN-Ps-11* (Herb. Hongo & ENCB). Tottori-pref., Mt. Daisen, *Nagasawa EN-Ps-14* (Herb. Hongo & ENCB). Tottori-city, *Nagasawa EN-Ps-12; EN-Ps-13 & EN-Ps-15* (Hongo Herb. & ENCB). Kyoto, Kita-ku, Kamigamo Experimental Forest of Kyoto University, *Yokoyama 1335* (Herb. Univ. Kyoto; ENCB). Sekizan Shrine, Sakyo Ku, *Yokoyama 1323* (Topotype) (Herb. Univ. Kyoto).

DISCUSSION. This species is close to *P. subcaerulipes* Hongo but differs in the form of the cheilocystidia. Yokoyama (1973) first reported this fungus as *P. subcaerulipes* Hongo, but later (1976) he described it as an independent species, in both cases as a hallucinogenic mushroom.

Cultures of this species are in Institute for Fermentacion at Osaka (Japan), Museo National d'Histoire Naturelle (Paris), and the University of Texas, Health Sciences Center (Austin Texas, U.S.A.).

The type was not studied by the author (it is in Univ. Kyoto Herb.; an isotype is in TNS), but the studied specimens sent by Yokoyama agree well with the original diagnosis (Yokoyama, 1976); as well some material from the Hongo Herb. sent by Nagasawa. These were identified by Hongo.

The name of the species refers to the whitish stipe like that of the silver.

84. *Psilocybe collybioides* Sing. & Smith *Mycologia* 50: 141, 1958. Figs. 430-431

Pileus 13-40 mm in diam., convex to subcampanulate, then expanded or becoming flattened (as a *Collybia*), with a slight umbo, glabrous and even but finally translucent striate when moist, viscid, hygrophanous, reddish brown to light ochraceous

brown with dingy pallid center, fading to pallid straw color. Staining slightly blue when touched.

Lamellae adnexed or adnate, whitish at first to brownish pallid or brownish orange, edges concolorous.

Lamellae adnexed or adnate, whitish at first to brownish pallid or brownish orange, edges concolorous.

Stipe 30-70 × 1.5-4.5 mm, equal to slightly thickened downward, often twisted-contorted, curved or irregular, stuffed to hollow, white to irregularly cinnamon-brown, fading to yellowish pallid, subsquamulose from the veil, later appressed finely fibrillose, apex fibrillose-pruinose. Basal mycelium sometimes strigose, white, forming white rhizomorphs.

Veil a cortinate-fibrillose mass of white fibrils, soon obliterated.

Context white to pallid or, in parts, cinnamon, always discolored under the cuticle and in cortex of stipe; turning green to blue when injured; fleshy in pileus, somewhat tough in stipe. Odor slightly farinaceous. Taste not checked.

Spores generally none (the material studied is almost sterile). They are 10 × 6.5 μm according to Singer & Smith (1958 a,b) or 5.5-6.6 × 3.3-4.4 μm in those few observed by the author in the type; they are subellipsoid both in face and side view, pallid yellowish brown, thin walled (no more than 0.5 μm thick), with a broad germ pore.

Basidia very scarce, hyaline, similar in size with the pleurocystidia, vesiculose, or not well formed. Basidioles similar to the pleurocystidia, hyaline or brownish are present.

Pleurocystidia 22-28 (-32) × 7.7-12 μm, hyaline, vesiculose or fusoid but mucronate or bottle shaped with a short neck 2.2-3.3 μm broad.

Cheilocystidia 12-27 × 5.5-11 μm, abundant, hyaline, fusoid-ventricose, mucronate or bottle shaped with a short neck, up to 7 μm long 3.3-5.5 μm broad.

Subhymenium subcellular, pale brownish, with irregular and small globose elements. Hymenophoral trama regular, hyaline to yellowish brown or orangish-brown, hyphae without pigment on the walls, thin walled, not more than 7 μm diameter. Epicutis as a gelatinized thin layer, formed by loosely arranged elongated narrow, hyaline hyphae. Hypodermium hyaline to brownish, with pigment moderately incrustated on the walls; hyphae elongated, thin walled. Clamp connections present.

HABITAT AND DISTRIBUTION. Gregarious on humus or small sticks or leaves and debris on the soil, in *Alnus jorullensis* forests. Fruiting in January to February. Known only from the type locality.

STUDIED MATERIAL. ARGENTINA, Prov. Tucumán, Eastern Tafi del Valle, *Singer T-1882* (Type MICH); *Singer T-3575* (MICH).

DISCUSSION. The only two known collections from the type locality are semi-sterile. They were collected at two different times, on January and February respectively,

and they have only few spores and basidia. Singer & Smith (1958 a,b) related this species to *Hypholoma cyanescens* Maire, = *Psilocybe maire* Sing., but the thin walled spores and the brownish elements in the hymenium related *P. collybioides* to *P. zapotecorum*. This species is apparently hallucinogenic because of the bluing feature. The record of *P. collybioides* from Australia (Southcott, 1974 and Hall, 1973) seems to be inexact. The Australian fungus may belong to one of the those species described by Guzmán & Watling (1978) from Australia and Tasmania (see *P. australiana* Guzmán & Watling, *P. eucalypta* Guzmán & Watling and *P. tasmaniana* Guzmán & Watling).

The name of the species refers to the aspect of the carpophore to those of *Collybia*.

85. *Psilocybe graveolens* Peck *Bull. N. Y. State Mus.* 167: 47, 1913. Figs. 436-438

Pileus (10-) 20-30 (-40) mm in diam., convex to subumbonate, then expanded with a slight umbo or sometimes depressed at the center, glabrous, even but slightly striate at the margin when moist or when dry, hygrophanous, brownish fading to creamy white to subalutaceous, or pale orange brownish, with some dark greenish tones.

Lamellae adnexed, somewhat close, yellowish brown to chocolate-brown, edges same color or somewhat pallid.

Stipe (20-) 40-60 × 2-5 mm, equal or somewhat thick towards the base or subbulbous, bluing, in dry conditions with dark violaceous tints, stuffed to hollow, white to brownish, silky fibrillose with white appressed to floccose fibrils from the veil. Base subhypogaeous like pseudorhiza, covered by soil.

Veil as arachnoid white fibrils, forming a very evanescent annulus in young stages.

Context whitish or pallid brownish, with "strong, persistent odor" (Peck, 1913). It seem to have a farinaceous odor and perhaps a farinaceous taste.

Spores (7-) 7.5-9.5 (-10.5) × (3.7-) 4.5-5.2 (-6) μm, ellipsoid or subellipsoid both in face and side view, yellowish brown, thin walled, with small apical distinct germ pore.

Basidia 21-26 × 6-7.5 μm, 4-spored, hyaline, subventricose or subcylindric.

Pleurocystidia 26-38 × 6-8 μm, hyaline, but some are pale brownish or yellowish brown, fusoid-ventricose, some with a short neck, or mucronate.

Cheilocystidia 12-22 × 5-8 μm, abundant, hyaline, sublageniform or lageniform, neck 2.4-4 μm broad, somewhat flexuous.

Subhymenium seemingly subcellular with short elements, subhyaline or brownish. Trama parallel, hyaline. Epicutis with subgelatinous thin layer of hyaline and repent hyphae. Hypodermium of interwoven hyphae, subhyaline to brownish. Clamp connections present.

HABITAT AND DISTRIBUTION. Caespitose or gregarious on marshy soils in meadows. Fruiting in November. Known only from the type locality.

STUDIED MATERIAL. U.S.A., New Jersey, Hackensack, *Ballou* s.n. (Nov. 1911) (Herb. Peck, NYSType).

DISCUSSION. This species is close to *P. zapotecorum* Heim emend. Guzmán in the form of its carpophore and its habitat, but it has larger spores. The strong odor reported by Peck (1913), the dark greenish or violaceous tones on the stipe, and the habitat in marshes also connects this species with *P. zapotecorum*. Smith (1948) related *P. graveolens* with *P. silvatica* (Peck) Sing. & Smith, but this latter species belong to section *Semilanceatae*.

The name of the species means strong smelling.

86. *Psilocybe kumaenorum* Heim Rev. Myc. 32: 206, 1967.

Pileus 5-7 mm in diam., conic to campanulate, then umbonate to expanded or somewhat convex when old, glabrous and even but the margin striate by transparence, subviscid, hygrophonous, brown or purplish brown, fading to beige when dry, with irregularly greenish or blackish tints.

Lamellae adnate, yellowish to brownish violet with a purpuraceous tone, with whitish edges.

Stipe 15-30 × 1.3-2 mm, equal or subbulbose base up to 2.5 mm broad, white to brownish, with some greenish to blackish tones, smooth but longitudinally fibrillose, with grayish or violet fibrils as remains of the veil on the upper part from the veil.

Veil arachnoid, white, evanescent, no annulus formed.

Context paler than the surfaces of the pileus or somewhat concolorous, but yellowish orange in the stipe; odor farinaceous.

Spores (5.5-) 6.6-7.7 (-8.8) × 3.3-4.4 μm, ellipsoid or subellipsoid both in face and side view, some with a slight median constriction, with thin walls (no more than 0.5 μm thick), pallid brownish, with a distinct apical pore and short appendage.

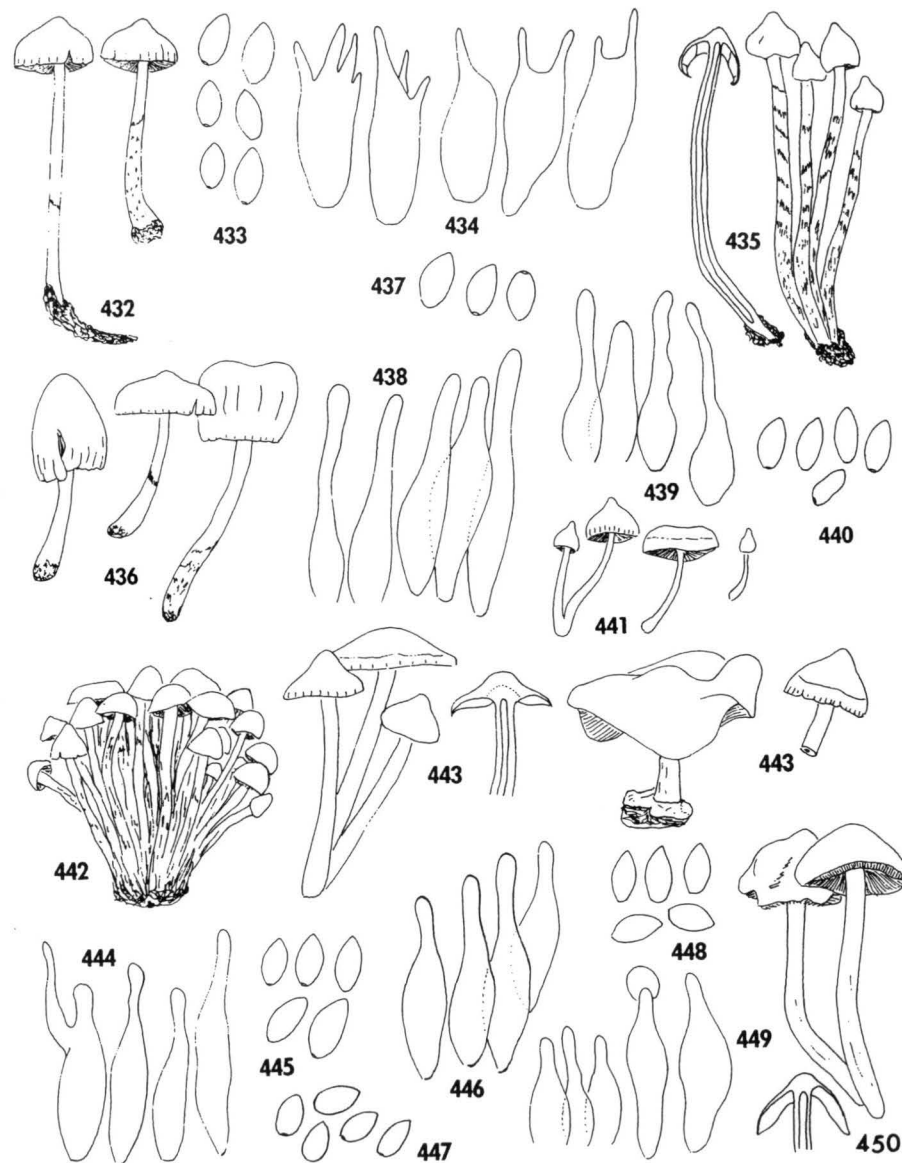


Plate 31: Figs. 432-450: - Several species of *Psilocybe*. 432-435: *P. argentipes*, 432: Carpophores, 433: Spores, 434: Cheilocystidia, 435: Carpophores (432: type; 433-434: Yokoyama 1323; 435: Nagasawa 15). 436-438: *P. graveolens*, 436: Carpophores, 437: Spores, 438: Cheilocystidia (all from the type). 439-441: *P. kumaenorum*, 439: Cheilocystidia, 440: Spores, 441: Carpophores (all from the type). 442-447: *P. muliercula*, 442-443: Carpophores, 444: Cheilocystidia, 445: Spores, 446: Cheilocystidia, 447: Spores (442: Guzmán 1627; 443: Guzmán 1648; 444-445: type; 446-447: type of *P. wassonii*). 448-450: *P. subcaerulipes*, 448: Spores, 449: Cheilocystidia, 450: Carpophores (all from the type).

Basidia (5-) 5.5-6.5 μm , 4-spored, with sterigmata 5-5.5 μm long, hyaline and pseudocylindric.

Pleurocystidia absent.

Cheilocystidia 11-17 $\times$ 3.3-5 μm , abundant, forming a sterile band, fusoid-ampullaceous or lageniform with long neck 1-2 μm diam., hyaline.

Subhymenium seemingly subcellular, with brown pigment irregularly incrusting on the walls of the more or less elongated or globose hyphae. Trama parallel, with hyphae 5-16.5 μm diam., hyaline or brownish from the pigment irregularly incrusting in the walls, broken like pores through the surface of the walls. Epicutis formed by parallel, slightly gelatinized hyphae, 1.5-5 μm diam., hyaline to somewhat incrusting with brown pigment on the walls like those of the trama. Hypodermium like the subhymenium, hyphae up to 15 μm diam. Clamp connections present.

HABITAT AND DISTRIBUTION. Gregarious on soil, in small groups, in open places among grasses. Known only from New Guinea. Fruiting in August.

STUDIED MATERIAL. NEW GUINEA, Papua, Western Highlands, Kundambi, Heim NG-36-B (PC, Type; ENCB, Isotype).

DISCUSSION. This species is close to *P. zapotecorum* in the spore features and in its white stipe, but it differs in the size of its cheilocystidia and in the absence of pleurocystidia. It is interesting to see that both species grow in similar subtropical forests at around 600-1800 m elevation. The complex wall of the spores, showed by Heim *et al.* (1967) and reported by Heim (1967), was not seen in the type, but was observed a contaminating fungus with large spores (possibly *Cortinarius*) with thick and verrucose walls. Heim in Heim *et al.* (*op. cit.*) emphasized that *P. kumaenorum* is an hallucinogenic species used by the Kuma Indians and has the local name "Koull tourroum".

The name of the species refers to the name of the Kuma Indians who use the fungus.

SELECTED ILLUSTRATIONS. Heim *et al.* (1967, frontispice plate) (color).

87. *Psilocybe muliercula* Sing. & Smith *Mycologia* 50: 142, 1958.

Figs. 442-447, 668-669, 708 & 713

P. mexicana var. *brevispora* Heim, *Comp. Rend. Ac. Sc.* 242: 1393, 1956.
P. wassonii Heim, *Rev. Myc.* 23: 119, 1958.

Pileus (5-) 15-40 (-50) mm in diam., convex or conic to campanulate or subumbonate, expanding when mature to more or less applanate but at the same time umbonate or slightly papillate, glabrous, even but slightly translucent-striate at the margin when humid, viscid to lubricous, hygrophanous, reddish brown or vinaceous brown, fading to fulvous brown or pale ochre from the umbo to the margin; in old specimens the pileus is undulate and somewhat rimose, frequently with blue-greenish tints.

Lamellae adnexed or sinuate, rather close, pale pink brownish to darker brown chocolate, edges concolorous or somewhat whitish.

Stipe (20-) 30-60 (-100) $\times$ (2-) 4-7 μm , equal or tapering upwards, becoming hollow or stuffed with white floccose mycelium, surface whitish pink, turning blue to blackish easily when touched or injured; becoming concolorous in the adults with the pileus especially below or darker, smooth and somewhat glabrous, but some (the young) covered by white floccose fibrils from the veil. Base with white floccose mycelium.

Veil as white arachnoid fibrils in the young stages but evanescent, not forming any annulus, or only a pseudo-annulus is present in young specimens.

Context whitish and pliant in the pileus, brownish pink and tough in the stipe; bluing easily in both. Taste and odor farinaceous, mainly in fresh and young specimens.

Spore print brown violaceous dark.

Spores (6-) 7-8 (-9.9) $\times$ 3.8-5 μm , subfusoid, subellipsoid or ellipsoid ovate both in face or side view, rarely subrhomboid with rounded angles in face view, thin walled, yellowish brown with a distinct apical germ pore.

Basidia 16-21 (-29) $\times$ 5.5-6.6 (-7.5) μm , 4 spored, ventricose or subcylindric with a slight median constriction.

Pleurocystidia absent.

Cheilocystidia 16-24 $\times$ 3.3-5 (-6) μm , abundant, hyaline, subulate to mucronate or sublageniform to lageniform, with more or less long, flexuous or moniliform neck 1.5-2 (-3) μm broad, sometimes irregularly branched; apex 2-4 μm diam.

Subhymenium subcellular, yellowish brown, formed by subglobose cells with the pigment distributed irregularly or incrusting on the walls. Trama regular, subhyaline or pale brownish, with thin to thick (1.5 μm) walled hyphae, 5-9 μm diam., not incrusting. Epicutis formed by a hyaline subgelatinous layer of elongated parallel hyphae, up to 5 μm diam. Hypodermium subcellular with thick (1.5 μm) walled hyphae, often incrusting on the walls with brown pigment. Clamp connections present.

HABITAT AND DISTRIBUTION. Gregarious to caespitose, rarely solitary in swamps or muddy soil without any vegetation, very rare among mosses, on the walls of the darker and very humid ravines, in *Abies* or *Pinus* forests, at 2600-3200 m elevation. Fruiting in August-September, rarely in October. Known only from Mexico.

STUDIED MATERIAL. MEXICO, State of Mexico, Northeastern Nevado de Toluca, Piedras Blancas (purchased to the Indians), *Guzmán 831* (ENCB); *Singer M-1611* (Type MICH, Isotype ENCB)*, Tenango del Valle market, *Herrera* (Sept. 30, 1956) (MEXU; PC; MICH); *Herrera* (Jul. 24, 1966) (MEXU 5245); *Stresser-Pean* (Sept.

*Singer & Smith (1958b) pointed out as type M-1011, but in 1958a they pointed out M-1611.

1957) (PC); *Stresser-Pean* (Nov. 1957) (PC); *Heim* (Sept. 1957) (PC)**; *Guzmán* 877 (ENCB); 1627 (ENCB; NY). Eastern Nevado de Toluca, Barranca del Diablo, *Guzmán* 1648 & 1743-A (ENCB). Northwestern Nevado de Toluca, San Francisco Oxtotilpan, *López Gonzalez* 312 (ENCB).

DISCUSSION. This species was reported first by *Heim* (1956b) under the name *P. mexicana* var. *brevispora* *Heim*, based on some specimens bought from the Indians in the market of Tenango del Valle, State of Mexico. The Indians consider the fungus as sacred with the name “mujercitas” (= little women) along with others also consider sacred: *Cordyceps capitata* (Holms. ex Fr.) Link and *C. ophioglossoides* (Ehr. ex Fr.) Link both with the name “hombrecitos” (= little men), and *Elaphomyces granulatus* Fr. and *E. reticulatus* Vitt. (the later reported by *Heim* as *E. variegatus* Vitt.) (*Heim & Wasson*, 1958) (the Indians call the *Elaphomyces* fungi “gran mundo”, that means great world). Later *Heim* (1957 c,d) described *P. mexicana* var. *brevispora* with the name of *P. wassonii* *Heim*, in honor to Mr. and Mrs. Wasson. The species was based on other material obtained from the same market and other from the town San Pedro Tlamiexco, close to Tenango del Valle. In all the cases the fungi were obtained from the Indians. *Heim*’s description (1957 c,d) was in French, but on April 29, 1958 he described the fungus in Latin (*Heim*, 1958). He did not designate any type. *Singer*, who was in Mexico in 1957 looking for hallucinogenic mushrooms, also bought the same “mujercitas” in Tenango del Valle market and with *Smith* (*Singer & Smith* 1958a), described it in Latin with the name *P. muliercula* *Sing. & Smith* in January-February 1958. *Heim & Wasson* (1958) described in *P. muliercula* cheilocystidia $20-32 \times 4.5-7 \mu\text{m}$, and *Singer & Smith* (1958 a,b) $12-23 \times 3-5.5 \mu\text{m}$.

The habitat of *P. muliercula* (= *P. wassonii*) was unknown by *Heim* and *Singer & Smith*. The species was reported only from the Tenango del Valle market. *Guzmán* (1958) reported for first time the wild habitat of this fungus in the eastern region of the high mountain Nevado de Toluca, situated 10 km to the east of Tenango del Valle, in a *Abies* forest at 3150-3250 m elevation. Later (*Guzmán & López González*, 1970) *P. muliercula* was reported from the northwestern Nevado de Toluca, but in an open *Pinus* forest in agriculture lands at 2600-2800 m elevation; in both places *P. muliercula* grows on swampy or muddy soils in ravines in darker or shade places.

This is an hallucinogenic fungus used by the Aztecs and Matlatzincas; the former live in the east of the Nevado de Toluca (Tenango del Valle region) and the latter in the western of the same mountain (in San Francisco Oxtotilpan) region. Here the fungi are called “santitos” (little saints). *Heim & Wasson* (1958) and *Singer & Smith* (1958b) reported interesting uses of this fungus in the Tenango del Valle region and *Guzmán & López-Gonzales* (1970) and *Escalante & López-González* (1971) reported information from San Francisco Oxtotilpan. *Heim & Cailleux* (in *Heim & Wasson*, 1958) made cultures of *P. muliercula*. They reported acremoniform hyphae in the mycelium. *Cuevas & Herrera* (1971) studied morphological variations in the mycelium obtained by culture and reported varicose hyphae and arthrospores. *Melendez-Howell* (1967) studied the microscopic structure of the wall of the spore.

**Not specimens at PC are pointed out as type of *P. wassonii* *Heim*.

P. muliercula is close to *P. subcaerulipes* *Hongo* from Japan but the spores are little smaller in that species ((5.5-) 6-6.6 (-7) μm long) and the cheilocystidia broader ($\times 5-7.5 \mu\text{m}$). It is also close to *P. zapotecorum* *Heim* emend. *Guzmán*, but differs in the absence of pleurocystidia.

The name of the species refers to the popular name of the fungus in Tenango del Valle market “mujercitas” (little women).

SELECTED ILLUSTRATIONS. *Heim & Wasson* (1958, frontipice) (color plate) (as *P. wassonii*).

88. *Psilocybe pintonii* *Guzmán* *Mycotaxon* 7: 247, 1978.

Figs. 451 A-B, 663 & 730-731

Pileus (10-) 15-30 (-40) mm in diam., convex to campanulate or subumbonate, slightly papillate, sometimes irregularly lobulate, eventually applanate or subconcave, glabrous and even but covered by white fibrils from the veil when young; sometimes slightly rimose, lubricous to dry, slightly transparent striate when moist, hygrophanous, chocolate brown to orange brown, fading to brownish yellowish or dirty yellow.

Lamellae sinuate or adnate, brownish to gray violet, thick, with whitish to colorous edges.

Stipe (18-) 25-60 $\times$ 3-5 mm, cylindric or somewhat subbulbous, hollow, whitish to subconcolorous with the pileus, covered toward the base by white floccose veil fibrils; base remaining somewhat blackish in dried specimens. Both pileus and stipe stain green-blue when injured.

Veil as conspicuous white arachnoid fibrils when young, but absent in the adult stage.

Context whitish to brownish, fleshy in the pileus, fibrous or tough in stipe; staining blue when cut, with farinaceous odor and taste.

Spores (6-) 6.6-7.7 (-8.8) $\times$ (3.3-) 4-4.5 μm , ellipsoid or subellipsoid, both in side or face view, somewhat subrhomboid in face view, thin walled, brownish yellow, with a broad germ pore.

Basidia 16-22 $\times$ 4.4-8 μm , 4-spored, hyaline, cylindric to pyriform, sometimes somewhat sinuous.

Pleurocystidia absent.

Cheilocystidia 17-20 $\times$ 4-7 μm , hyaline, ventricose or fusoid with capitate or subcapitate apex, 3-5 μm broad and irregularly branched, lageniform, mixed with basidia in different stages of deformation.

Subhymenium seemingly subcellular, with brownish, without incrusting pigment, but with thick irregular walls in the hyphae; these elongated to subglobose 6-25 μm broad. Epicutis as a subgelatinized thin layer, formed by hyaline elongated and

parallel hyphae 3-5 μm broad. Hypodermium with subglobose elements, 4-8 μm broad, reddish brownish or somewhat hyaline.

HABITAT AND DISTRIBUTION. Solitary or gregarious in small groups, on soil without herbaceous vegetation, in high mountain with *Espeletia*, in Paramos vegetation, at 3450-3600 m elevation. Known only from the type locality. Fruiting July to August.

STUDIED MATERIAL. COLOMBIA, Cundinamarca Dept., Páramo de Palacio, Hacienda La Siberia, road La Calera to La Mina, near the branch to Rincón del Oso, *Guzmán 9160* (ENCB); *Guzmán 9762* (Type COL, Isotype ENCB).

DISCUSSION. This species is close to *P. argentipes* Yokoyama from Japan and *P. muliercola* Sing. & Smith from Mexico, but the form of the cheilocystidia separate them, as well as the habitat. This is very probably an hallucinogenic fungus because of its bluing reaction and farinaceous taste and odor, but there is no information about its use in Colombia.

This species is named in honor of Dr. Polidoro Pinto botanist from the University of Colombia, who helped the author in his two trips to Colombia in 1965 and 1971.

89. *Psilocybe subcaerulipes* Hongo *Jour. Jap. Bot.* 33: 44, 1958.

Figs. 448-450 & 737

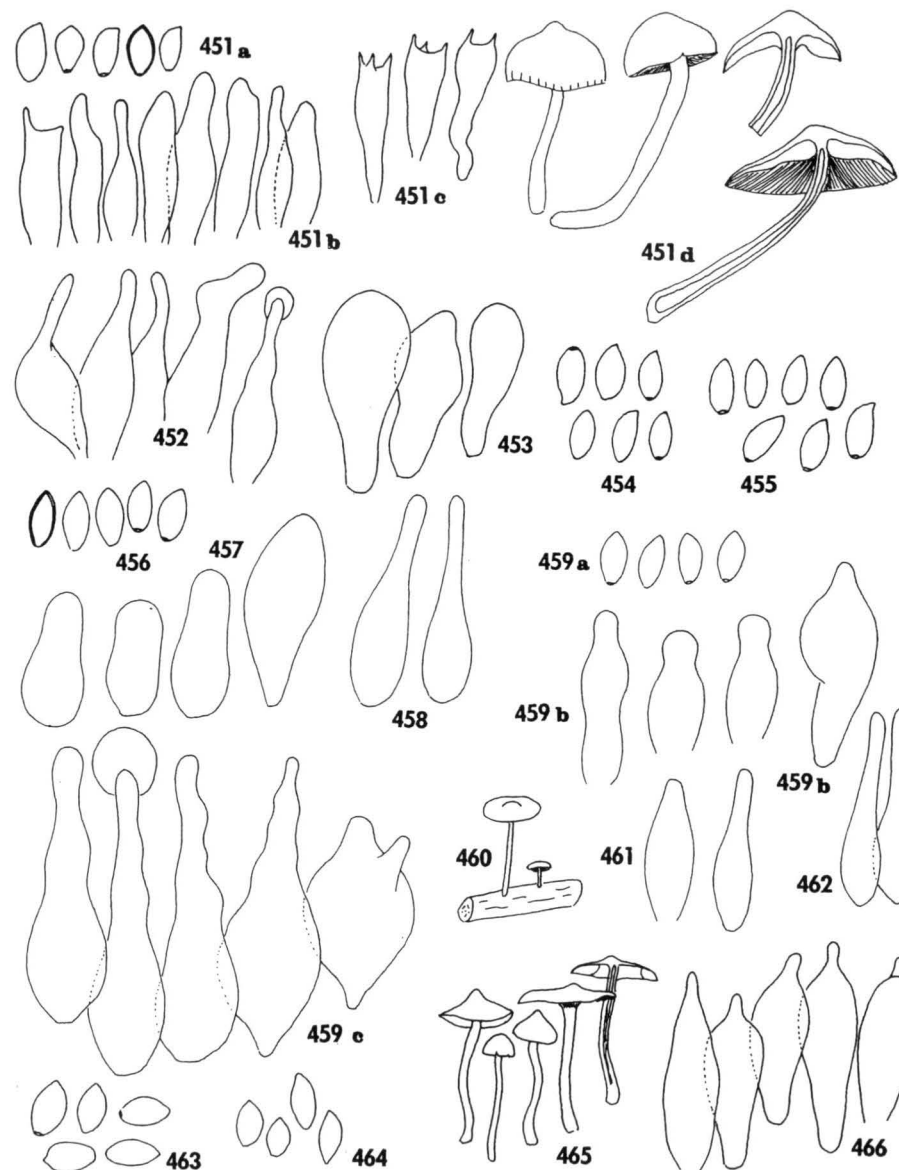
Pileus 20-30 mm in diam., conic to campanulate or convex to subumbonate, submamillate, glabrous or with small floccose white scales from the veil; even to slightly striate at the margin, viscid, hygrophanous, ochraceo-fulvus or sordid alutaceous to ochraceous, tawny olive, brownish yellow or argillaceous; staining blue or darker when injured or touched.

Lamellae adnate or adnexed, whitish brown to dark violaceous brown, with subfloccose concolorous edges.

Stipe 40-70 $\times$ 3-5 mm, equal, flexuous, hollow, whitish to ochraceous or brown-reddish, fibrillose, covered by whitish fibrils toward the base.

Veil as a white arachnoid-fibrillose curtain but fugaceous. No annulus formed.

Plate 32: Figs. 451A-D-466. - Several species of *Psilocybe*. 451A-D: *P. pintonii*, 451-A: Spores, 451B: Cheilocystidia, 451C: Basidia, 451D: Carpophores (A-C: from the type; D: *Guzmán 9160*). 452-458: *P. zapotecorum*, 452: Cheilocystidia, 453: Pleurocystidia, 454-456: Spores, 457: Pleurocystidia, 458: Cheilocystidia (452: Dumont PE-756; 453: Furtado; 454: type; 455: type of *P. bolivarii*; 456-458: type of *P. lazoii*). 459A-C: *P. laticystis*, A: Spores, B: Cheilocystidia, C: Pleurocystidia (all from the type). 460-464: *P. pallidispora*, 460: Carpophores, 461: Cheilocystidia, 462: Pleurocystidia, 463: Spores (all from the type). 464-466: *P. horakii*, 464: Spores, 465: Carpophores, 466: Cheilocystidia (all from the type).



Context whitish to concolorous with pileus, bluing. Taste and odor recorded.

Spores (5.5-) 6-6.6 (-7.5) (-8.5!) $\times$ 3.8-4.4 (-5.5) $\times$ 3.3-3.8 μm , suboval in face view, subellipsoid to slightly inequilateral on side view, thin walled, pale yellowish brown, with a distinct apical germ pore.

Basidia 16-18.5 $\times$ 5-5.5 μm , 4-spored, hyaline, ventricose.

Pleurocystidia absent.

Cheilocystidia 15-22 $\times$ 5-7.5 μm , hyaline, thin walled, more or less abundant, fusoid-ventricose with a short to long neck 1-1.5 μm broad. Sometimes with a hyaline viscous drop at the apex.

Subhymenium seemingly subcellular with short elements, subhyaline or brownish pale, with abundant and conspicuous pigment grayish blue incrusting. Trama parallel, hyaline with hyphae around 11 μm in diam., thin to thick walled. Epicutis formed by a subgelatinous layer, with hyaline to brownish hyphae 2-3 μm broad. Hypodermium brownish to hyaline, with elongated hyphae, up to 12 μm diam. Clamp connections present.

HABITAT AND DISTRIBUTION. Caespitose or gregarious on soil among mosses or grasses in forest. Known only from the type region locality. Fruiting from May to September.

STUDIED MATERIAL. JAPAN, Shiga-pref., Otsu, Mii-dera, *Hongo 1634* (type) (Hongo Herb.); 162, 164, 361 & 2537 (Hongo Herb.). Otsu-city, *Yamada & Okayama EN-Ps-10* (Hongo Herb. & ENCB).

DISCUSSION. *P. muliercula* Sing. & Smith from Mexico is a possible synonym, but more information on the Japanese material is needed to confirm this. It appears now that only small differences in the size of the spores and cheilocystidia are the only differences between them. Cultures of this hallucinogenic fungus are in the Institute for Fermentation at Osaka, Japan. The herbarium specimens of the photo. (Fig. 737) (*Hongo 2028*) was not studied by the author; it is tentatively identified with reservations with *P. subcaerulipes*. The interrelationships of *P. subcaerulipes* and *P. caerulipes* (Peck) Sacc. are very slight because the structure of the spores is completely different. That species belongs to the Section *Semilanceatae*.

90. *Psilocybe zapotecorum* Heim, emend Guzmán *Nova Hedwigia* 29: 633, 1978. Figs. 452-458, 467-476, 672-673, 707, 747-750, 751-754, 769 & 775

P. zapotecorum Heim, *Rev. Myc.* 22: 77, 1957.

P. zapotecorum f. *elongata* Heim, *Comp. Rend. Acad. Sc.* 250: 1158, 1960. *Nom. nudum*.

P. candidipes Sing. & Smith, *Mycologia* 50: 141, 1958.

P. aggericola Sing. & Smith, *Mycologia* 50: 142, 1958.

P. bolivarii Guzmán, *Ciencia, Méx.* 26: 25, 1968.

P. lazoi Sing., *Nova Hedw. Beih.* 29: 242, 1969.

Pileus (10-) 30-70 (-110) mm in diam., variably in form, from conic or convex when young to subumbonate and papillate or convex to campanulate to convoluted or subconcaave when old; glabrous and even but translucent striate when moist, subviscid, hygrophanous, reddish brown or orange brown, fading to beige, beige rose, orangish rose, beige-orange or straw color when dry, strongly staining blue or greenish to blackish very easily and irregularly when injured or in old specimens; sometimes finally purpuraceous brown from deposited spores.

Lamellae sinuate or adnate, pale brownish to violet brown or violet-purple, edges concolorous or somewhat pale.

Stipe (40-) 100-200 $\times$ (3-) 5-10 (-12) mm, equal or somewhat subbulbous, sometimes with a pseudorhiza or bulbous, other times flexuous and irregular in diameter, white to grayish or irregularly brown-reddish or red vinaceous; hollow, floccose above to strongly scabrous-strigose at the base. Bluing very soon when touched or injured, sometimes with blackish violet tones through the surface.

Veil white, floccose and soft, forming a fugacious annular structure in the upper part of the stipe; readily staining blue when injured or in old specimens.

Context whitish but in old specimens rufous brown in the stipe, fleshy in pileus, fibrous in the stipe; odor and taste strong to weakly farinaceous, variable in age. Staining blue when cut.

Spore print brown purpuraceous violet.

Spores (5.5-) 6.6-7.1 (-8.8) $\times$ 3.8-4.4 (-5.5) $\times$ 3.2-4 μm , oblong-ellipsoid or ovoid both in face and side view, with thin walls, pallid brownish, with a distinct apical pore and short appendage.

Basidia 15.4-24.2 (-28) $\times$ 4.4-5.5 (-9) μm , 4-spored, subcylindric or clavate, some more or less sinuoses, hyaline.

Pleurocystidia 19.8-38 $\times$ 5.5-14 μm , numerous, hyaline, stains easily with cotton-blue; a few are pallid brownish mainly toward the base, very heterogenous in form, fusoid-clavate, ventricose, submucronate or pyriform, some with the apex divided irregularly, or arbusculiform.

Cheilocystidia 13-27 $\times$ 3.5-6 μm , hyaline, abundant, forming a sterile band, ventricose to fusoid, pyriform, or ventricose-rostrate, or lageniform, with long neck 1.5-2.2 μm diameter, sometimes with a globose hyaline viscous drop at the apex.

Subhymenium seemingly subcellular, formed by small elements, with purpuraceous brown pigment distributed irregularly; frequently blue pigment is present in the subhymenium and hymenium, from the strong bluing reaction of this fungus. Trama regular, brownish to hyaline, with pigment diffused or some incrusting on the walls of the hyphae; the hyphae are 5.5-18 μm in diameter with walls about 1.5 μm thick. Lactiferous hyaline or grayish hyphae, 3.2-5 μm diameter are more or less common. Epicutis with slightly gelatinized, thin layer of parallel and brownish to hyaline hyphae, 1.3-4 μm in diameter. Hypodermium formed by hyaline subglobose or elongate hyphal cells 4-25 μm in diameter, hyaline or brownish, somewhat thick-walled (1.5 μm). Clamp connections very common.

HABITAT AND DISTRIBUTION. Gregarious or caespitose, rarely solitary, on soil, frequently in swampy or muddy soil, but also found in humus, among leaves and debris, in the deciduous forest and coffee plantations; also on a humid soil inside of indian houses in very dark corners (*Guzmán 1502*). Common on the walls of the ravines on muddy argillaceous soils without herbaceous vegetation. In Mexico, in subtropical (deciduous) forests between 600-1800 m elevation and in South America in subtropical forests.

STUDIED MATERIAL. MEXICO, Guerrero, 30 km Northwestern Chilpancingo, Omiltemi zone, *Acosta 129* (ENCB). Oaxaca, Huautla de Jiménez region, *Singer M-1154* (MICH Type of *P. candidipes*, ENCB Isotype); *Guzmán 925; 954; 1847-A; 1882 & 12502* (ENCB, but 954 also in MICH); *Herrera & Pérez s.n.* (Aug. 1967) (MEXU 5756); *Herrera s.n.* (Jul. 30, 1967 & Jul. 6, 1969) (MEXU 5570, 5754 & 7254); *Johnson 73* (ENCB); *Ott s.n.* (Jul. 15, 1975) (ENCB); *Leslie 1927* (ENCB); *Pollock 1-76; 4-76; 7-28-78-2* (all in ENCB); *Jacobs 54-A* (ENCB); *Morlan 43-76* (ENCB). Road Tuxtepec to Ixtlan de Juarez, near La Esperanza, *Guzmán 16221; 16225 & 16249* (all in ENCB); *Pérez-Ortiz 693 & 703* (ENCB). Mihuatlán region, near La Paz, *Bigwood et al. s.n.* (Jul. 27, 1976) (ENCB); near Sebastian Rio Hondo, *Leslie 1509; 1520; 1521; 1522; 1523; 1524; 1525; 1526; 1527 & 1531* (all in ENCB). San José del Pacífico, *García s.n.* (Aug. 12, 1966) (MEXU 4846); *Arroyo s.n.* (Aug. 13, 1966) (MEXU 3941); *Herrera s.n.* (MEXU 4310); *Ott et al. s.n.* (Jul. 30-31, 1976) (ENCB); *Ott & Pollock 76-10; 76-11; 76-16; 76-18* (all in ENCB); *Bigwood 01 & 02* (ENCB); *Jacobs 16 & 17* (ENCB). Market of Zapotitlán, *Arroyo s.n.* (Sept. 30, 1961) (MEXU 7632). San Agustín Loxicha, *Guzmán 1502* (ENCB); *Chilton et al. s.n.* (Jul. 28, 1976) (ENCB). San Miguel Suchixtepec, *McDougal s.n.* (Apr. 19, 1958) (ENCB). Yaitepec, *Heim s.n.* (Aug. 4, 1956) (Type PC, Isotype ENCB); *Heim s.n.* (Jul. 1956) (PC); *Heim s.n.* (Jul. 1958) (PC). State of Sinaloa, road El Salto (Durango) to Mazatlán, near Temple, *Guzmán 4803* (ENCB Type of *P. candidipes*). State of Morelos, Northern Tetela del Volcan, Cerro Zempoaltepec, *Mora 125* (ENCB). State of Veracruz, Chiconquiaco zone, near Mizantla, *Stresser-Pean s.n.* (Sept. 1960) (PC Type of *P. zapotecorum* f. *elongata*); Loma Alta, *Evans s.n.* (Jul. 1965) (MEXU 2998); Santa Rita, *Herrera s.n.* (Jul. 9-10, 1966) (MEXU 3915; 6298); Santa Rita to Yecuatla, *Hernández s.n.* (Jul. 9, 1966) (MEXU 6298). Southern Banderilla, Cerro La Martinica, *Guzmán 16364* (ENCB). Near Acatépec, *Jacobs 72 & 73* (ENCB). Near Xalapa, road to Coatepec, *López 1123* (ENCB; Herb. Univ. Veracruzana). Carretera Xalapa to Perote, Piletas to El Soldado, *Guzmán 17801* (ENCB).

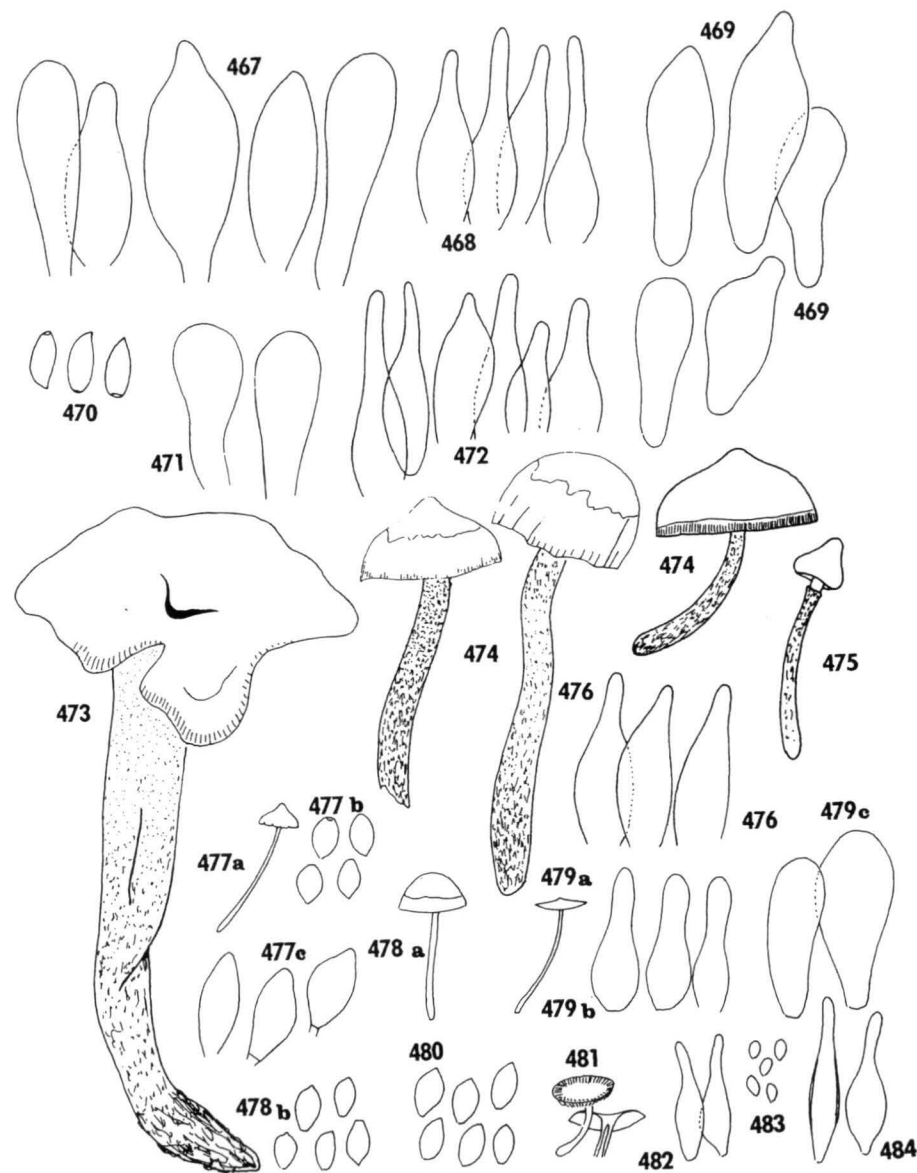


Plate 33: Figs. 467-484. - Several species of *Psilocybe*. 467-476: *P. zapotecorum*, 467: Pleurocystidia, 468: Cheilocystidia, 469: Pleurocystidia, 470: Spores, 471: Pleurocystidia, 472: Cheilocystidia, 473-475: Carphophores, 476: Cheilocystidia (467-468: type; 469 & 472: type of *P. candidipes*, 470-471 & 474: type of *P. bolivarii*; 473: MEXU 4310; 475: *Guzmán 1502*). 477A-C: *P. pyrispora*, A: Carphophores, B: Spores, C: Pleurocystidia (all from the type). 478A-B: *P. scatigena*, A: Carphophore, B: Spores (both from the type). 479A-C: *P. singeriana*, 479A: Carphophore, B: Cheilocystidia, C: Pleurocystidia, 480: Spores (all from the type). 481-484: *P. venezuelana*, 481: Carphophores, 482: Cheilocystidia, 483: Spores, 484: Pleurocystidia (from Dennis).

COLOMBIA, Dept. Magdalena, Sierra Nevada de Santa Marta, San Lorenzo, near Estación Inderena, *Pulido* 272 (COL; ENCB). Via San Lorenzo-Refugio, *Pulido* 292; 321 & 325 (COL; ENCB).

PERU, Dept. of Huanuco, road to Pucalpa, 38 km from Ringo Maria, *Dumont* PE-756; PE-809 & PE-810 (NY).

BRAZIL, Parque do Estado Sao Paulo, *Furtado* s.n. (Jun. 13, 1961) (SP 62044; ENCB).

CHILE, Colchagua, Pumanque, La Viñita, *Lazo* PU-151 (NY Type of *P. lazoi*).

ARGENTINA, Dept. Jujuy, Jaire, *Alvarado* s.n. (Jan. 9, 1965) (= *Singer* B-4129) (BAFC as *P. aggericola* var. *alvaradoi* Sing.). Prov. Tucuman, road to Tafi del Valle, near Monumento al Indio, *Singer* T-760 (Type of *P. aggericola*, Isotype in ENCB).

DISCUSSION. *P. zapotecorum* was described for first time from San Agustín Loxicha, State of Oaxaca (Mexico) (Heim, 1956b) but without any Latin diagnosis. Later was described from Yaitepec, in the State of Oaxaca, also in French language (Heim, 1957a). The Latin diagnosis (Heim, 1957b) did not give any information on the type neither on the type locality. Singer & Smith (1958b) did not study any of Heim's material, but Singer (1958a) redescribed this species based on specimens belonging to *P. hoogshagenii* Heim (see discussion of *P. hoogshagenii* on the specimen *Guzmán* SA-1501) (the pl. 19 in Ott, 1976 as *P. zapotecorum*, belongs to this specimen). The descriptions of Heim (1957b and Heim & Wasson, 1958) show a fungus with conic or papillate pileus, thin stipe, and with strong variation of the color. The variable features of *P. zapotecorum* led Singer & Smith (1958b) and Guzmán (1968a) to consider as independent species those fungi found in Huautla de Jiménez and in the State of Sinaloa, respectively, which were described as *P. candidipes* Sing & Smith and *P. bolivarii* Guzmán. In fact, *P. zapotecorum* presents a great variability in the form and color of the fruit body (see Figs. 473-475 & 747-754), even in its habitat. It grows on swamp soil, on debris of the forests, and on muddy soil. This confusion in the concept of *P. zapotecorum* forced the author (Guzmán, 1978c) to do an emendation of Heim's description. The emendation was based on a study of the type of *P. zapotecorum*, as well as those of *P. candidipes*, *P. bolivarii* and *P. zapotecorum* f. *elongata*, as well as in the study of more than 50 herbarium specimens in ENCB, MEXU and PC. In figs. 473-475 & 753 it is possible to see that there is no difference between the spores of *P. zapotecorum*, *P. candidipes* and *P. bolivarii*. In figs. 452-458 & 467-472 there is no appreciable variation in either the pleurocystidia, spores and cheilocystidia.

P. zapotecorum f. *elongata* Heim was described (in Stresser-Péan and Heim, 1960, 1961) from Sierra de Chiconquiaco in the State of Veracruz, based on a fungus with a long stipe. More recently (in Heim *et al.*, 1967) Heim & Cailleux redescribed this from the same locality and from Juquila, State of Oaxaca. But a study of the type (in PC) shows that this fungus has the same kind of spores, pleurocystidia and cheilocystidia as the type form; the only difference is the long stipe, which, in this instance, is not considered as having taxonomic value. *P. zapotecorum* f. *elongata* is a *nomen nudum* because it was described only in French language.

The synonymy with *P. aggericola* Sing. & Smith and with *P. lazoi* Sing. is here established and based on a study of both types (at MICH and NY, respectively). Guzmán (1978a) supposed that *P. aggericola* is the same as *P. zapotecorum*. The only differences considered by Singer & Smith (1958a) with *P. candidipes* Sing. & Smith (another synonymous of *P. zapotecorum*) is the color of the stipe (white in *P. candidipes* and darker in *P. aggericola*) but this feature does not have any taxonomic value. *P. lazoi* Sing. differs from *P. zapotecorum* only in its habitat: "*Ad firmum in umbrosis*" wrote Singer (1969, 1970), based on the collector's notes, but it seems that this is not exact, because the type of *P. lazoi* seems to be collected on soil because the remains on the stipe, and agrees well with *P. zapotecorum*, which is unknown on dung. The color plate (Fig. 2 in Singer, 1970) of *P. lazoi* agrees well with *P. zapotecorum*.

P. zapotecorum is a hallucinogenic mushroom. Heim & Hofmann (1958) isolated psilocybin. However, Ott & Guzmán (1976) reported *P. bolivarii* without psilocybin neither psilocin, probably because the study was based on old piece of the type, collected in 1961. *P. zapotecorum* is a very important mushroom among the Zapotec and Mazatec Indians in Mexico. They know the fungus with many popular names (see 2a. part, Chapter 5 of this monograph).

P. zapotecorum has been cultured by Heim & Cailleux (1957), Heim & Wasson (1958), Heim *et al.* (1963) and Cuevas & Herrera (1971). Culture 109, identified as *P. zapotecorum* by Cuevas and Herrera (*loc. cit.*) is really *P. caerulescens* as was discussed. Heim and Cailleux reported arthrospores and acremoniform hyphae on the mycelium; they obtained pale yellowish carpophores with long and whitish floccose stipe.

There is some confusion on the type of *P. zapotecorum* in PC, because they have as type three different collections: 1) Leg. Heim, Yaitepec, 4 Août 1956; 2) Leg. Heim, Yaitepec, Juillet 1958, and 3) Leg. Heim, No. 125, Juillet 1956. On the other hand, Heim (in Heim & Wasson, 1958), designated as type, "Heim et Wasson No. J. 125, 3-8-1956, environs de Yaitepec". But the first report of this species (Heim, 1956b) was based on a collection made by Wasson in San Agustín Loxicha in July 1955. Guzmán (1978c) selected the collection "*Heim, Yaitepec, 4 Août 1956*" at PC as the type (Heim kindly gave a Isotype to ENCB Herbarium).

SELECTED ILLUSTRATIONS. Guzmán (1978d, p. 116); Heim & Wasson (1958, fig. 29; pl. XVI, fig. 7; pl. XVII; pl. XXI, figs. 7-8); Heim *et al.* (1967, fig. 11 & pl. V); Ott & Bigwood (1978, color plates, figs. 6 (as *P. caerulescens*) & 12); Singer (1970, fig. 2, as *P. lazoi*).

The name of the species refers to the Indians in the type locality that use this mushroom in Mexico (Zapotecs in the State of Oaxaca).

Section Singerianae Guzmán, Sect. nov.

Pleurocystidiis hyalinis; sporis subellipticis vel subrhomboidae tenuitunicatis. Specimina non caerulescentes. Type: *P. singeriana* Guzmán.

Pleurocystidia hyaline. Spores subellipsoid or somewhat subrhomboid, thin walled. No bluing species, distributed from the temperate regions to the tropical forests, mainly in America.

Species considered in this Section: 91. *P. bulbosa* (Peck) Smith, 92. *P. fimicola* Guzmán, 93. *P. horakii* Guzmán, 94. *P. laticystis* Guzmán & Smith, 95. *P. pallidispora* (Murr.) Smith, 96. *P. pyrispora* (Murr.) Smith, 97. *P. scatigena* (B. & C.) Guzmán, 98. *P. singeriana* Guzmán, 99. *P. subalnetorum* Guzmán & Horak, 100. *P. subborealis* Guzmán & Smith, 101. *P. tuxtlensis* Guzmán, 102. *P. venezuelana* Dennis, and 103. *P. washingtonensis* Smith.

Key to species

- 1a. Pleurocystidia lageniform (with a neck). 2
- 1b. Pleurocystidia fusoid or subcylindric (without a neck). 5
- 2a. Cheilocystidia very variable in form, from fusoid-ventricose or mucronate to clavate with short neck. Pleurocystidia 38-56 (-64) $\times$ 9-12 μ m. Growing on decaying coniferous wood. Known only from the State of Washington (U.S.A.). 103. *P. washingtonensis*
- 2b. Cheilocystidia mostly uniform in form. 3
- 3a. Cheilocystidia large 30-65 μ m long. Pleurocystidia 40-65 $\times$ 9-15 μ m, with thick wall in the middle portion. Species known only from Venezuela. 102. *P. venezuelana*
- 3b. Cheilocystidia small, no more than 34 μ m long. 4
- 4a. Cheilocystidia mostly fusoid and mucronate, 16-28 $\times$ 5-7 μ m, with a mucro 2-3 μ m diam. Pleurocystidia 30-44 $\times$ 6-10 μ m. Growing on fallen sticks. Known only from Jamaica. 95. *P. pallidispora*
- 4b. Cheilocystidia subpedicelated, or they have a median constriction, rarely fusoid and mucronate, 13-30 $\times$ 8-13 μ m, mucro 4-6 μ m diam. Pleurocystidia 30-49 (-60) $\times$ 10-19 μ m. Growing on rotting wood. Known only from Oregon and Idaho (U.S.A.). 94. *P. laticystis*
- 5a. Pileus convex, neither umbonate nor campanulate. 6
- 5b. Pileus conic, campanulate or subumbonate. 8
- 6a. Pleurocystidia larger, 33-60 $\times$ 11-15 μ m, fusiform or ventricose, both mucronate. Cheilocystidia as the pleurocystidia in form and size, both yellowish or brownish toward the base. Growing on dung. Known only from the high mountains (páramos) of Colombia. 92. *P. fimicola*

- 6b. Pleurocystidia smaller than 30 μ m, always hyaline. 7
- 7a. Pleurocystidia mucronate, broadly ventricose, symmetric or asymmetric, 19.6-26.6 $\times$ 11.2-14 μ m. Growing on sticks. Known only from the northwestern U.S.A. 100. *P. subborealis*
- 7b. Pleurocystidia not mucronate. 8
- 8a. Pleurocystidia abundant, 15-19 μ m long. Growing on dung. Known only from Cuba. 97. *P. scatigena*
- 8b. Pleurocystidia scarce, 18-24 μ m long. Growing on stems. Known only from New York. 91. *P. bulbosa*
- 9a. Pleurocystidia broad, 11-16 μ m diam. 10
- 9b. Pleurocystidia narrow, 7-11 μ m diam. 11
- 10a. Pleurocystidia hyaline to yellowish, frequently mucronate, neck more than 4 μ m long. Pileus subumbonate. Known only from Argentina in *Alnus* forests. 99. *P. subalnetorum*
- 10b. Pleurocystidia always hyaline, not or rarely mucronate, neck no more than 3 μ m long. Pileus umbonate. Known only from New York. 96. *P. pyrispora*
- 11a. Cheilocystidia like the pleurocystidia in form and size. Growing on dung. Known only from Argentina. 93. *P. horakii*
- 11b. Cheilocystidia different from the pleurocystidia. 12
- 12a. Pleurocystidia ventricose, not mucronate, 22-25 $\times$ 8.8-9.9 μ m. Spores (6-) 6.6-7.1 (-7.7) μ m long. Growing on fallen leaves. Known only from Brazil (Bahia). 98. *P. singeriana*
- 12b. Pleurocystidia fusoid and mucronate, 20-28 $\times$ 7-9 μ m. Spores 5.5-6 (-6.6) μ m long. Lignicolous species. Known only from Mexico (State of Veracruz). 101. *P. tuxtlensis*

91. ***Psilocybe bulbosa*** (Peck) Smith *Mycologia* 40: 694, 1948. Figs. 110A & 117 A-C

Deconica bulbosa Peck, *Ann. Rep. N. Y. State Mus.* 46: 107, 1893.

Pileus 6-12 mm in diam., convex, becoming nearly plane, glabrous, even, slightly striate on the margin, probably hygrophanous, pale brownish fading to pale yellowish orange.

Lamellae adnate, pale purplish brown, with whitish edges.

Stipe 15-25 $\times$ 1-1.5 mm, equal to subbulbous, hollow, somewhat flexuosus, fibrillose, whitish to grayish or brownish.

Context thin, whitish, apparently unchanging and without any odor and flavor.

Spores (6-) 6.6-7.7 (-8.8) $\times$ 4.5-5.5 (-6.6) $\times$ 3.3-4.5 μm , obscurely subrhomboid in face view, subellipsoid in side view, dull yellowish brown, more or less thick walled (0.5-1 μm thick), with a narrow apical germ pore.

Basidia 20-24 $\times$ 6-7 μm , 4-spored, hyaline, subventricose.

Pleurocystidia 18-24 $\times$ 6-7 μm , hyaline, scarce, sometimes difficult to locate (they are imbedded in the subhymenium), obtusely fusoid ventricose, not really mucronate.

Cheilocystidia 20-28 $\times$ 4-8 μm , hyaline, abundant, similar to pleurocystidia or more elongated or sublageniform, often with a drop of a mucilaginous substance adhering to the apex.

Subhymenium pallid brownish with diffused pigment. Trama parallel, hyaline to pale brownish. Epicutis as a thin gelatinous hyaline pellicle, with hyphae 1.5-3 μm diam. Hypodermium with subelongated hyphae like those of the trama. Clamp connections present.

HABITAT AND DISTRIBUTION. Singly or gregarious on dead stems of herbs. Fruiting in September. Known only from the type locality.

STUDIED MATERIAL. U.S.A., New York, Delmar, Peck (NYS type).

DISCUSSION. This is a poor known species. It is close to *P. peruviana* Sing. and *P. chilensis* Sing., but it appears that the form of the pleurocystidia and the cheilocystidia separate them (see Sect. *Atrobrunneae*). More studies are necessary on fresh material in order to better known the taxonomic status of these species. Smith (1948) presented a microscopic study of the type. The observations of Murrill (1922b) and Saccardo (1895) do not give much information. Peck (1912) did not consider this species.

The name of this species refers to the subbulbous stipe.

92. *Psilocybe fimicola* Guzmán *Mycotaxon* 7: 241, 1978. Figs. 345 A-B & 505

Pileus about 10 mm broad, convex, glabrous but with some white floccose traces of the silky evanescent veil, even but slightly striate by translucence when moist, lubricous, hygrophanous, brown to reddish yellow, fading to ochraceous or straw color.

Lamellae broad adnate, brownish to vinaceous brown, with the edges concolorous or somewhat paler.

Stipe about 25 $\times$ 1 mm, equal, hollow, somewhat flexuosus, whitish to reddish brown, covered with floccose and white more or less evanescent fibrils from the veil.

Veil cortinate, rudimentary or evanescent in the adults.

Context whitish in the pileus, brownish in stipe, not changing of color. Taste and odor none.

Spores (6.6-) 7.7-8.8 (-11) $\times$ 4.4-5 (-6) $\times$ 3.8-5 μm , ellipsoid both in frontal and lateral view, sometimes slightly subrhomboid in face view, thin walled (no more than 0.5 μm thick) with a broad germ pore.

Basidia 25-30 $\times$ 6-7 μm , 2-or 4-spored, hyaline, subcylindric to pyriform.

Pleurocystidia abundant, in size, shape and structure like the cheilocystidia, but many yellowish or brownish towards the base.

Cheilocystidia 33-60 $\times$ 11-15 μm , abundant, hyaline, few are yellowish or brownish toward the base, fusiform or ventricose but mucronate; the mucro 4.4-5.5 μm long.

Subhymenium seemingly subcellular with short globose brownish yellow elements; pigment irregularly incrusting on the walls. Trama regular, with orange brown diffused pigment or hyaline. Epicutis as a thin subgelatinized layer with hyaline thin (no more than 2 μm diam.) hyphae. Hypodermium irregularly incrusting with brown yellow pigment to hyaline, formed by elongated hyphae, up to 7 μm diam. Clamp connections present.

HABITAT AND DISTRIBUTION. Gregarious on horse dung, in the "páramos" (high mountain meadows of South America), at 3400 m elevation. Known only from the type locality. Fruiting in July.

STUDIED MATERIAL. COLOMBIA, Department of Cundinamarca, Páramo de Palacio, Hacienda La Siberia, road La Calera to La Mina, Guzmán 9096 (Type COL, Isotype ENCB).

DISCUSSION. The yellowish or brownish cystidia towards the base, and the floccose stipe, connects this species with *P. zapotecorum*, but the fimicolous habitat and the lack of the bluing feature separated them. On the other hand *P. fimicola* has the habit and habitat of *P. coprophila* (Bull. ex Fr.) Kumm., but has microscopic features completely different. *P. scatigena* (B. & C.) Guzmán is a closely related fimicolous species, but this has pleurocystidia 15-19 $\times$ 6-7 μm . The cheilocystidia, like the pleurocystidia, connect this species with *P. horakii* Guzmán, also a coprophilous species, but differs in the size of the cheilocystidia and spores.

The name of this species refers to the coprophilous or fimicolous habitat.

93. *Psilocybe horakii* Guzmán *Mycotaxon* 7: 244, 1978. Figs. 464-466

Pileus 8-21 mm in diam. convex to conic-campanulate or subumbonate, glabrous and even, not viscid, hygrophanous, dark brown when moist, drying paler or yellowish.

Lamellae broadly adnate to subdecurrent, argillaceous or orange brown, edge concolorous.

Stipe 30-35 $\times$ 1-2 mm, equal or attenuate towards apex, hollow, pale brown to reddish brown, somewhat fibrillose or floccose, base with white tomentum.

Veil inconspicuous at least in the adults not well developed or soon obliterated.

Context whitish or brownish, not staining blue; odor pleasant (sweetish); taste not checked.

Spores print dark brown.

Spores (5.5-) 6-7.1 (-7.7) $\times$ 3.8-4.4 $\times$ 3.3-3.8 μm , subellipsoid in lateral view, somewhat subrhomboid in face view, thin walled, yellowish brown, with a narrow germ pore.

Basidia 16-22 $\times$ 4.4-5.5 μm , 4-spored, hyaline, ventricose.

Pleurocystidia 19.5-30 (-46) $\times$ 7.7-9.9 (-12) μm , hyaline, very numerous toward the edge of the gill, ventricose and mucronate or fusoid-cylindrical and mucronate; mucro 1.6-5.5 $\times$ 1.4-3 μm .

Cheilocystidia similar to the pleurocystidia in size and form, abundant, hyaline.

Subhymenium subcellular, formed by short globose hyaline elements, irregularly pigmented with brownish orange incrusting pigment. Trama regular, brownish with parallel hyphae, somewhat incrusting by pigment. Epicutis a subgelatinized, thin layer, formed by parallel, hyaline to brownish hyphae. Hypodermium hyaline, formed by more or less elongated hyphae. Clamp connections present.

HABITAT AND DISTRIBUTION. Subgregarious on dung, in meadows of a subtropical region. Known only from the type locality.

STUDIED MATERIAL. ARGENTINA, near Jujuy, Lagunas de Yala, *Horak 66-454* (Type ZT, Isotype BAFC).

DISCUSSION. This species is close to *P. fimicola* Guzmán but differs in having smaller spores and pleurocystidia, as well in the form of the pileus.

This species is named for Dr. E. Horak of Zürich, who collected the type and helped the author sending all his collections and notes on *Psilocybe* from many parts of the world.

94. *Psilocybe laticystis* Guzmán & Smith *Mycotaxon* 7: 515, 1978.

Figs. 459 A-C & 688-689

Pileus 10-35 mm in diam. convex becoming campanulate to subumbonate, expanding to nearly plane, glabrous, even but striate by translucence on margin when moist, viscid to subviscid when fresh, hygrophanous, dull vinaceous brown to dark chestnut or chocolate brown, fading from the margin to the disc to a grayish tan.

Lamellae broadly adnate to subdecurrent, dull brown to dark vinaceous brown ("Rood's brown"), becoming chocolate brown, edges even and concolorous.

Stipe 20-45 (-60) $\times$ 1-3 (-4) mm, equal or narrowed to the base, dark vinaceous

brown below and paler above, soon blackish brown from the base upward, with a grayish mycelial pad at the base and surface covered overall by grayish fibrils.

Veil not well developed, white-fibrillose and on the upper part of the stipe and on margin of pileus at first but all traces soon obliterated.

Context thin, fragile to pliant, taste mild, odor none.

Spore print dark chocolate color.

Spores (5.5-) 6-6.6 (-7.7) $\times$ (3.3-) 3.8-4.4 μm , ellipsoid to subovoid both in face and side view, yellowish brown, thin-walled, with a broad apical pore.

Basidia 18-25 $\times$ 5.6-7 μm , 4-spored, hyaline, subcylindric with a median constriction.

Pleurocystidia 30-49 (-60) $\times$ 10-19 μm , abundant, hyaline, thin-walled, lageniform to obclavate, the neck moniliform or stragulate, 4-6 μm wide at apex, some with a hyaline globule adhering near the apex or on it.

Cheilocystidia 13-30 $\times$ 8-13 μm , more or less abundant, hyaline, subventricose or ventricose-mucronate.

Subhymenium no seemingly subcellular, formed by elongated hyphae 4-8 μm diam., with a diffuse brownish orange pigment. Tramal hyphae parallel, hyaline to brownish with some incrustations of orange-brown pigment, thin to thick-walled, 6-17 μm diam. Cuticle of pileus an ixocutis, the hyphae elongate, and hyaline. Hypodermium not well distinct from the trama proper, formed by elongated hyaline hyphae. Clamp connections present.

HABITAT AND DISTRIBUTION. Gregarious on sticks or logs of conifer wood. Known only from Oregon and Idaho (U.S.A.). Fruiting in October-November.

STUDIED MATERIAL. U.S.A., Idaho, Upper Priest River, *Smith 71298; 73814 and 73670* (all in MICH). Oregon, Grant Pass, *Smith 55383* (Type MICH).

DISCUSSION. This species is close to *P. washingtonensis* Smith and *P. pallidispora* (Murr.) Smith but mainly differs in the cheilocystidia. *P. washingtonensis* has two types of cheilocystidia and *P. pallidispora* has narrow cheilocystidia, 5-7 μm in diam.

The name of this species refers to the broad pleurocystidia and cheilocystidia.

95. *Psilocybe pallidispora* (Murr.) Smith *Mycologia* 40: 701, 1948. Figs. 460-464

Atylospora pallidispora Murr., *Mycologia* 10: 22, 1918.
Psathyra pallidispora Murr., *Mycologia* 10: 33, 1918.

Pileus about 10 mm broad, convex to subexpanded, with a short conic umbo, surface dry, finely tomentose, not striate, pale fulvous with a peculiar sheen, fading to straw color.

Lamellae adnate, brownish chocolate or latericeous-fulvus, entire and pallid on the edges (floccose when seen with a lens).

Stipe about 13×1 mm, equal, cartilaginous, concolorous with pileus above, dark below, fading to straw color, finely fibrillose lacerate.

Veil cortinate, inconspicuous soon obliterated.

Context thin and fragile. Color, taste and odor not checked.

Spores (5-) $6-7 (-8.2) \times 3.8-4.9 \times 3.3-4 \mu\text{m}$, subrhomboid or ellipsoid in face view, subellipsoid in side view, pale yellowish brown, thin walled, with a very small apical pore.

Basidia $16-20 \times 5-6 \mu\text{m}$, 4-spored, hyaline, subcylindric or subfusoid.

Pleurocystidia $30-44 \times 6-10 \mu\text{m}$, scattered, hyaline, fusoid, or ventricose, or sublageniform, with elongated necks and acute apices, the apex frequently with a hyaline viscous drop.

Cheilocystidia $16-28 \times 5-7 \mu\text{m}$, hyaline, fusoid ventricose, mucronate, the mucro $2-3 \mu\text{m}$ diameter, often with viscous substance adhering to apex.

Subhymenium with elongated to subglobose elements with yellowish brown pigment irregularly incrusting on the walls. Trama regular, dark brown or yellowish brown. Epicutis formed by a hyaline non gelatinous thin layer of elongated hyphae. Hypodermium similar to the hyphae of the subhymenium. Clamp connections present.

HABITAT AND DISTRIBUTION. Scattered on fallen sticks. Known only from the type locality, in a subtropical forest, at 1500 m elevation. Fruiting in December-January.

STUDIED MATERIAL. JAMAICA, Cinchona, *Murrill 666* (Type NY).

DISCUSSION. This poorly known species is close to *P. laticystis* Guzmán & Smith. Smith (1948) studied the type and Dennis (1968) reported with doubt this species from Jamaica: "I have queried the determination because I do not see pleurocystidia up to $44 \mu\text{m}$ long, as described Smith. It does not agree with any European species known to me", wrote Dennis (*op. cit.*). Dennis' paper did not report the pleurocystidia in his description. The pallid spores observed by Murrill (1918) may not be a taxonomic significant feature. However, the name of the species refers to the pale color of the spores.

96. ***Psilocybe pyrispora*** (Murr.) Smith *Mycologia* 40: 703, 1948.

Figs. 477 A-C

Deconica pyrispora Murr., *Mycologia* 14: 261, 1922.

Pileus about 10 mm broad, convex to campanulate and umbonate, surface glabrous and dry, somewhat striate at the margin, hygrophanous, brownish or avellaneous to yellowish brown.

Lamellae adnate to slightly decurrent, purplish brown, edges concolorous.

Stipe about 35×15 mm, equal, glabrous, fibrillose toward the base, reddish brown or chestnut colored.

Context not studied.

Spore print violaceous brown.

Spores (5.6-) $6.3-7 (-7.7) \times 4-4.5 (-5.6) \mu\text{m}$, subrhomboid or subellipsoid in face view, ellipsoid or ovate in side view, yellowish brown or dull yellowish brown, moderately thick walled ($1 \mu\text{m}$ thick), with an apical and small germ pore.

Pleurocystidia $18-26 (-32) \times 10-15 \mu\text{m}$, scattered to abundant broadly ovate to fusiform, rarely with a short mucron, thin walled, hyaline, but highly refractive in KOH but contents homogenous.

Cheilocystidia $18-26 \times 4-7 \mu\text{m}$, hyaline, narrowly ventricose to subcylindric, with necks straight or flexuous and apices often with a hyaline mucilage.

"Gill trama not reviving well but apparently subgelatinous in KOH; pileus trama a broad band of indistinct hyaline hyphae forming the upper region, lower region brown (upper portions apparently subgelatinous in KOH but details were not distinct)" (Smith, 1948).

HABITAT AND DISTRIBUTION. Solitary, on wood and humus. Known only from the type locality. Fruiting in August.

STUDIED MATERIAL. U.S.A., New York City, New York Botanical Garden, *Murrill* (Type, NY).

DISCUSSION. This is a poorly known species close to *P. subalnetorum* Guzmán & Horak, but the form and color of the pleurocystidia separate well them. Smith (1948) studied the type and pointed out the curious pleurocystidia.

The name of species refers to the form of the spores, subrhomboid, like a pear (*pyrus*, = pear).

97. ***Psilocybe scatigena*** (B. & C.) Guzmán, comb. nov.

Figs. 478 A-B

Agaricus (Psilocybe) scatigenus B. & C., *Jour. Linn. Soc. (Bot.)* 10: 292, 1869.

Deconica scatigena (B. & C.) Sacc., *Syll. Fung.* 5: 1058, 1887.

Pileus about 6 mm broad, convex, glabrous, even but slightly striate by transparency in the margin when moist, hygrophanous, brown reddish to brown yellowish.

Lamellae adnate, brownish, concolorous.

Stipe about 20×2 mm, central, equal, glabrous above, tomentose at the base.

Spores $6.5-8 \times 4.5-5.2 \mu\text{m}$, subellipsoid both in side and face view, but sometimes obscurely subrhomboid in face view, with a broad germ pore, thin walled pale yellowish brown.

Basidia not observed.

Pleurocystidia 15-19 $\times$ 6-7 μ m, scarce, hyaline, ventricose or subpyriform.

Cheilocystidia not observed.

Subhymenium and trama hyaline to brownish, with collapsed hyphae. Epicutis as a subgelatinous thin and hyaline layer of elongated hyphae. Clamp connections present.

HABITAT AND DISTRIBUTION. Solitary on dung. Known only from Cuba.

STUDIED MATERIAL. CUBA, *Wright* s.n. (*Cub. Fung.* 292) (NY, Type).

DISCUSSION. The type is not in very good condition, however it is sufficient to consider this species provisionally as good taxon belonging to the Section *Singerianae*. This species, together with *P. horakii* Guzmán and *P. fimicola* Guzmán, are the only fimicolous species in the section, and it is probable that each has a wide distribution throughout the tropics. Murrill (1918) considered this species, following Saccardo (1887), as *Deconica*. The scarce pleurocystidia are difficult to study, as are the obscurely subrhomboid spores. Berkely & Broome (1868) wrote: "The minute spores distinguish this from *A. bullaceous*", but more material is required for a satisfactory understanding of this species.

The name of this species probably refers to the growth of the fungus, from the Latin *scateo* that means flow out or to come out.

98. *Psilocybe singeriana* Guzmán, sp. nov.

Figs. 479 A-C & 480

Pileus plus minus 14 mm latus, subconicus vel subconvexus, fuscus vel rufobrunneo. Lamellae decurrentibus, fumoci subfuliginiae. Stipe plus minus 29 $\times$ 1.3 mm sordide castaneus. Velo nullo. Carne subspadiceous, non caerulescentes. Sporis (6-) 6.6-7.1 (-7.7) $\times$ 3.5-4.4 μ m subrhomboideus vel subellipsoideis tenui tunicata. Pleurocystidiis 22-25 $\times$ 8.8-9.9 μ m, hyalinis, ventricosus vel subventricosus, non mucronatus. Cheilocystidia 16.5-24 $\times$ 5.5-6.6 μ m, hyalinis, subfusiformis vel sublageniformis. Cuticula pileorum subgelatinosa. Hypodermium subcellularis. Hyphs fibulatis. Ad dejectus folium in silvis tropicalibus. Prope Itabuna, Bahia (Brasil). Typus: Singer B-11171 (INPA).

Pileus about 14 mm diam., subconic to convex or somewhat applanate, umbonate, glabrous, sulcate and striate over one half of the radius, somewhat viscid, hygrophanous, dark brown to beige rose or brownish.

Lamellae short decurrent or adnexed, smoke-gray-subfuliginous to reddish brown with whitish edges.

Stipe about 29 $\times$ 1.3 μ m, equal or very slightly and gradually tapering upwards, dull chestnut brown above, deep chestnut brown below to grayish brown.

No veil developed in the adult.

Context somewhat brownish, when fresh without any odor and taste.

Spores (6-) 6.6-7.1 (-7.7) $\times$ 3.5-4.4 μ m, subrhomboid or subellipsoid both in face and side view, thin walled (no more than 0.5 μ m thick), pale to dark yellowish brown with a broad germ pore.

Basidia 14-19 $\times$ 5.5-6.6 μ m, 4-spored, hyaline, subcylindric or ventricose, sometimes with a slightly median constriction.

Pleurocystidia 22-25 $\times$ 8.8-9.9 μ m, scarce, hyaline, ventricose, not mucronate.

Cheilocystidia 16.5-24 $\times$ 5.5-6.6 μ m, more or less abundant, hyaline, subfusiform or sublageniform, with short neck 3.3-4.4 μ m diam.

Subhymenium subcellular, with short elements with orange brown pigment, very irregularly incrustated on the walls. Trama parallel, hyaline or yellowish brown, incrustated. Epicutis as a subgelatinous, thin layer of repent parallel hyphae, hyaline or somewhat pigmented. Hypodermium subcellular, pigmented like the subhymenium to hyaline. Clamp connections present.

HABITAT AND DISTRIBUTION. Solitary on a fallen leaf of a bombacaceous tree, in a tropical forest. Known only from the type locality. Fruiting in June.

STUDIED MATERIAL. BRAZIL, Bahia, Itabuna, *Singer B-11171* (Type INPA).

DISCUSSION. This species is close to *P. tuxtensis* Guzmán, but the form of the pleurocystidia separate well both species; *P. tuxtensis* is lignicolous and only known from a tropical forest of Mexico. *P. singeri* Guzmán is an independent species, belongs to Sect. *Brunneocystidiatae*, discussed above.

This species is named in honor of Dr. Rolf Singer, noted Mycologist, who helped the author in his studies in Agaricales. Dr. Singer collected the type and kindly sent it to the author.

99. *Psilocybe subalnorum* Guzmán & Horak *Mycotaxon* 521, 1978. Figs. 492-495

Pileus 10-12 mm in diam, conic to campanulate, subumbonate, glabrous, even, but striate towards the margin when moist, dry, covered with pale fibrils, hygrophanous, dark brown when moist, drying yellowish brown.

Lamellae broadly adnate to subdecurrent, argillaceous to pale rust brown, edge concolorous.

Stipe 20-25 $\times$ 1-1.5 mm, cylindrical, flexuous, concolorous with pileus, covered with minute fibrils, hollow.

Veil inconspicuous in the adults, except for the appressed whitish fibrils on the pileus and stipe.

Context brownish, not bluing. Odor absent; taste mild.

Spores 6.6-7.7 (-8.8) $\times$ (3.8-) 4.4-5.5 μ m, subrhomboid or subellipsoid in face view, thin walled, yellowish brown, with a broad germ pore.

Basidia 15-25 $\times$ 5-6 μ m, 4-spored, hyaline, fusoid or subcylindric.

Pleurocystidia 16-38 $\times$ 11-16 μ m, rare, hyaline or some with a pale yellowish diffused pigment, broad ventricose pyriform, frequently mucronate; the neck is cylindric or moniliform, 4-7 $\times$ 2-4 μ m.

Cheilocystidia $16-25 \times 5-7 \mu\text{m}$, no so abundant, hyaline, narrow ventricose and mucronate, with short neck $3-4 \mu\text{m}$ diameter.

Subhymenium subcellular, consisting of irregular small and globose hyaline cells whose walls are here and there irregularly encrusted with yellowish brown pigment, occasionally forming false chrysocystidia in the hymenium (as in *P. montana* (Pers. ex Fr.) Kummer). Trama consisting of parallel hyaline hyphae ($3-20 \mu\text{m}$ diam.), walls irregularly encrusted with yellowish brown pigment. Epicutis a thin subgelatinous layer of elongated hyphae. Hypodermium of hyaline hyphae, irregularly encrusted. Clamp connections present.

HABITAT AND DISTRIBUTION. Gregarious among humus of *Alnus jorullensis*. Known only from the type locality.

STUDIED MATERIAL. ARGENTINA, Prov. Tucuman, Sierra de San Javier, San Agustín, Horak 66/476 (Type ZT, Isotype in BAFC).

DISCUSSION. *Psilocybe subalnetorum* Guzmán & Horak is closely related with *P. alnetorum* (Sing.) Sing. (as is indicated by specific name) and *P. cokeriana* Smith & Hesler. It differs, however, in the pleurocystidia. In the latter two species the pleurocystidia have hyaline and refringent central globule or body, as the note by the author in the types (in BAFC and MICH). The author recently (Guzmán, 1980) considered these latter species in the genus *Naematoloma* because of their pleurocystidia (considered chrysocystidia). *P. subalnetorum* is also close to *P. pyrispora* (Murr.) Smith; but the pleurocystidia of that species are always hyaline and, a mucronate apex is usually absent, or, if present, the neck does not exceed $3 \mu\text{m}$ in length. In all the taxa mentioned here, the size and shape of the spores and fruit bodies are alike. Guzmán and Horak (1978) first considered this species as belonging to the same group as *P. crobula* (Fr.) M. Lange ex Sing., but the presence of pleurocystidia separate well this species from that group (Sect. *Psilocybe*).

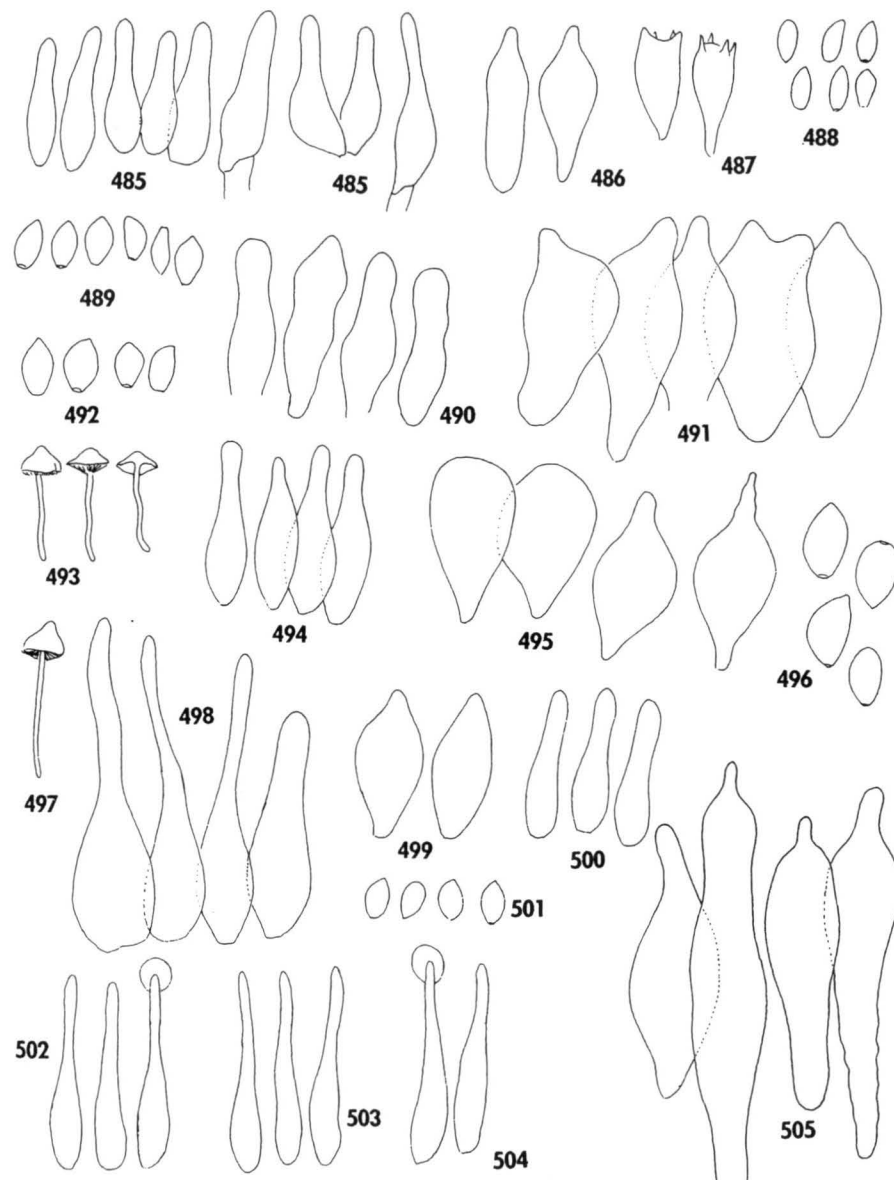


Plate 34: Figs. 485-505. - Several species of *Psilocybe*. 485-488: *P. tuxtlensis*, 485: Cheilocystidia 486: Pleurocystidia, 487: Basidia, 488: Spores (all from the type). 489-491: *P. subborealis*, 489: Spores, 490: Cheilocystidia, 491: Pleurocystidia (all from the type). 492-495: *P. subalnetorum*, 492: Spores, 493: Carpophores, 494: Cheilocystidia, 495: Cheilocystidia (all from the type). 496: *P. pratensis*, spores (type). 497-501: *P. washingtonensis*, 497: Carpophore, 498: Pleurocystidia, 499-500: Cheilocystidia, 501: Spores (all from the type). 502-503: *P. castanella* var. *castanella*, 502-503: Cheilocystidia (502: type; 503: type of *P. californica*). 504: *P. castanella* var. *sybhyperella*, Cheilocystidia (type). 505: *P. fimicola*, Cheilocystidia (type).

100. *Psilocybe subborealis* Guzmán & Smith *Mycotaxon* 7: 517, 1978.

Figs. 489-491 & 690

Pileus 15-20 mm in diam. convex to subumbonate, glabrous and even, slightly striate at the margin by transference when moist, margin silky at first but soon glabrous overall, when faded more or less sulcate, viscid at first, hygrophanous, dark reddish brown ("Warm Sepia"), fading to cinnamon buff or dull orange-buff.

Lamellae broadly adnate, dark cocoa-color, becoming violaceous brown, edges concolorous or somewhat paler than the faces.

Stipe 25-38 × 1-2 mm, equal or slightly thickened at base, somewhat flexuosus, lower part cocoa-color, paler above, whitish or gray-silky over all.

Veil cortinate and rudimentary, soon evanescent except for the appressed silky fibrils.

Context thin and pliant, concolorous with pileus, taste mild, odor none.

Spores (5.5-) 6-6.6 (-7.1) × (3.3-) 3.8-4.4 μm, ellipsoid to subovoid both in face and side view, thin walled (no more than 1 μm thick), brownish, with distinct apical germ pore.

Basidia 13-22 × 6-7 μm, 4-spored (rarely some 2-spored) subventricose, hyaline.

Pleurocystidia 19.6-33 × 10-13.5 (-16) μm, common, ventricose or some clavate, or mucronate (shape regular or versiform), apex 3-4 μm wide, hyaline, but the apex sometimes yellowish.

Cheilocystidia 18-30 × 8-10 μm, hyaline, ventricose, somewhat mucronate, neck at times with one or more constrictions (moniliform or "strangulated").

Subhymenium seemingly subcellular, with short elements hyaline but with an ochraceous-brown pigment irregularly distributed but very abundant. Gill trama of parallel, hyaline to brownish hyphae 6-11 μm diam., thin walled, with pigment irregularly distributed on the walls. Cuticle of pileus an ixocutis, the hyphae narrow, appressed and hyaline. Hypodermium not well differentiated from pileus trama. Clamp connections present.

HABITAT AND DISTRIBUTION. Gregarious to scattered on conifer sticks and debris. Known only from Northern of U.S.A. Fruiting on October.

STUDIED MATERIAL. U.S.A., Idaho, Boundary County, Priest Lake, *Smith 54068* (Type MICH). Michigan, Ithaca, *Potter 105606* (MICH).

DISCUSSION. This species is close to *P. laticystis* Guzmán & Smith, but the shorter broader non lageniform pleurocystidia separates well these species. Both fungi are very similar in general appearance and they are closely related with *P. crobula* (Fr.) M. Lange ex Sing., but differ in the presence of pleurocystidia. The material studied from Michigan is a new record.

The name of this species refers to the more or less Northern distribution of the fungus. However, it is independent of *P. borealis* Guzmán which belongs to the Section *Atrobrunneae*.

101. *Psilocybe tuxtensis* Guzmán, sp. nov.

Figs. 485-488

Pileus plus minus 10 mm latus, conicus vel subumbonatus, subviscidus, rufo-brunneus vel brunneus aurantiacus, glaber. Lamellae adnatae, brunneae. Stipe plus minus 25 × 1 mm, brunneolus, subbulbosus, subfloccosus. Carne albida, inodora. Sporae 5.5-6 (-6.6) × 3.3-3.8 μm, subellipsoideis, tenui tunica. Pleurocystidiis 20-28 × 7-9 μm, hyalinis, fusiformis vel sublageniformis. Cheilocystidiis 13-24 × 4.4-6.6 (-7.7) μm, hyalinis. Epicutis subgelatinoscentibus, hyaline. Hypodermium filamentosus, hyalinae. Hyphis fibuligerum. Ad lignum putridum in silvis tropicalibus. Prope Los Tuxtlas, Veracruz (Mexico). Typus: Guzmán 17196 (ENCB).

Pileus about 10 mm diam., conic to subumbonate, then convex to somewhat applanate, glabrous, even, subviscid, subhygrophanous, reddish brown fading to orangish brown or brownish.

Lamellae adnate, brownish to orange brown, edges concolorous or somewhat whitish.

Stipe about 25 × 1 mm, equal to subbulbous, pale brownish to yellowish straw color, covered by floccose whitish fibrils.

Veil cortinaceous, poorly developed, not forming annulus.

Context thin, pliant, whitish, without any odor and taste.

Spores 5.5-6 (-6.6) × 3.3-3.8 μm, subellipsoid both in face and side view, thin walled (no more than 0.5 μm thick), pale yellowish brown, with a broad germ pore.

Basidia 16-22 × 6.6-7.7 μm, 4-spored, hyaline, subventricose or pyriform.

Pleurocystidia 20-28 × 7-9 μm, hyaline, not so abundant, fusoid and mucronate, sometimes with slight medial constriction.

Cheilocystidia 13-24 × 4.4-6.6 (-7.7) μm, abundant, forming a sterile band, hyaline, fusoid-ventricose or sublageniform, with a short neck 2.2-4.4 μm diam.

Subhymenium subcellular, with short globose elements, hyaline but irregularly incrustated with brownish pigment on the walls. Trama parallel, hyaline or brownish, with diffused pigment; hyphae up to 6 μm diam. Epicutis formed by a subgelatinous, thin layer, with elongated repent hyaline hyphae; some are irregularly incrustated on the walls by brownish pigment. Hypodermium hyaline, with elongated to subglobose hyphae, thin to thick walled, irregularly incrustated, up to 9 μm diam. Clamp connections present.

HABITAT AND DISTRIBUTION. Solitary on rotting wood in tropical rain forest, at 200 m elevation. Fruiting in July. Known only from the type locality.

STUDIED MATERIAL. MEXICO, State of Veracruz, Los Tuxtlas region, Biological Station of the University of Mexico, *Guzmán 17196* (Type ENCB; Isotype NY).

DISCUSSION. A species close to *P. singeriana* Guzmán which is also a tropical fungus, but differs in the form of the pleurocystidia and in the size of the spores.

The name of this species refers to the name of the type locality region "Los Tuxtlas".

102. *Psilocybe venezuelana* Dennis *Kew Bull.* 15: 137, 1961.

Figs. 481-484

Pileus 15-20 mm in diam., convex, or becoming depressed umbilicate, glabrous, margin somewhat striate, hygrophanous, dark purpuraceous brown, becoming pale yellowish, not blackening.

Lamellae adnate to subdecurrent, wood brown color, edges concolorous.

Stipe 15-20 × 1.5 mm, equal, hollow, subglabrescent, reddish brown.

Context whitish, unchanged. Odor and flavor not reported.

Spores (5-) 6-7 (-7.5) × (3.5-) 4-4.5 μm, ellipsoid or subellipsoid, violaceous brown.

Pleurocystidia 40-65 × 9-15 μm, hyaline, lageniform, thick walled at the middle portion.

Cheilocystidia (30-) 45-65 × 9-12 μm, lageniform or sublageniform, thin walled, probably hyaline.

Other microscopic features unknown.

HABITAT AND DISTRIBUTION. On sandy soil, at 2000 m elevation in the high mountain (páramos). Fruiting on June. Known only from the type locality.

STUDIED MATERIAL. VENEZUELA, Dept. Federal, El Avila, *Dennis 1048* (K Type) (*no vidi*).

DISCUSSION. The above description is adapted from that of Dennis (1961; 1970). The type was not studied by the author (K did not send the herbarium material to Mexico). Dennis' species is close to *P. washingtonensis* Smith because the form of its pleurocystidia, but the cheilocystidia in that species are very variable in form and the pileus is conic at first.

SELECTED ILLUSTRATIONS. Dennis (1970, pl. 9, fig. 18, color).

103. *Psilocybe washingtonensis* Smith *Journ. Elisha Mitchell Sci. Soc.* 62: 199, 1946.

Figs. 497-501

Pileus 19-20 mm in diam., conic to convex, glabrous, even to somewhat striate at the margin when moist, viscid, pellicle separable only in shreds, with a faint marginal fringe from a rudimentary veil, hygrophanous walnut brown, opaque when moist, fading to brownish cinnamon color and when faded yellowish or beige.

Lamellae broadly adnate, but slightly decurrent in age, horizontal at the stipe, brown or slightly darker than the pileus, with whitish edges.

Stipe 30-50 × 1.5-2.5 mm, equal, but sometimes subbulbous, hollow, rather pliant and flexuosus, surface concolorous with pileus but becoming reddish or blackish brown in age, covered with grayish fibrils, with a grayish mat of mycelium at the base.

Veil cortinate, poorly developed except for the appressed silky fibrils on the pileus and stipe, annulus not formed.

Context pliant, thin 2 mm in the disc, vinaceous brown, pallid tan when faded; odor faintly fragrant, taste bitterish.

Spore print purple brown.

Spores (6-) 6.6-7.5 (-8) × 3.8-4.5 μm, ellipsoid to slightly ovoid, both in face and side view, thin walled, pallid brownish yellow with a small and inconspicuous apical germ pore.

Basidia 18-24 × 5-6 μm, 4-spored, hyaline, narrowly clavate to subcylindric.

Pleurocystidia 38-56 (-64) × 9-12 μm, hyaline, scattered to abundant on the edge of the gill, lageniform or narrowly fusoid ventricose with long necks and obtuse to subacute apex. Sometimes with hyaline mucilage adhering to the apex or neck.

Cheilocystidia 18-38 × 7-12 μm, abundant, hyaline, variable in form, one are fusoid ventricose and frequently mucronate, with obtuse to subacute apices, often with short and irregular proliferations, others are clavate to capitate with short neck.

Subhymenium yellowish brown not cellular, formed by elongated appressed hyphae. Trama with dark yellowish brown to hyaline, elongated hyphae, parallel to somewhat interwoven. Epicutis forming by a thin gelatinous pellicle, with dark yellowish brown hyphae. Hypodermium similar those hyphae of the trama. Clamp connections present.

HABITAT AND DISTRIBUTION. Gregarious on decaying conifer debris or humus, in conifers forests. Known only from the Pacific Northwest of U.S.A. Fruiting in September to October.

STUDIED MATERIAL. U.S.A., Washington, Mt. Angeles, Olympic National Park, *Smith 17097* (Type MICH). Oregon, Salmon River, above Welches, *Smith 24547* (MICH).

DISCUSSION. The variable forms of the cheilocystidia separate well this species from the other species of the Section. Because of its lageniform pleurocystidia it is related with *P. venezuelana* Dennis, *P. pallidispota* (Murr.) Smith, and *P. laticystis* Guzmán & Smith, as was discussed above.

The name of the species refers to the name of the State of Washington, the type locality.

Section *Pratensae* Guzmán, sect. nov.

Sporis tenui tunicae, subellipsoideis vel subrhomboideis. Pleurocystidiis nulla. Non caerulescentes. Typus: *P. pratensis* Orton.

Spores subellipsoid or slightly rhomboid, thin walled, no more than 0.5 μm thick. Pleurocystidia absent, non bluing species.

The species included in this section are: 104. *P. apiculosa* Orton, 105. *P. castanella* Peck var. *castanella*, 106. *P. castanella* var. *subhyperella* (Sing.) Guzmán, 107. *P. muscorum* (Orton) Moser, 108. *P. novae-zelandiae* Guzmán & Horak, 109. *P. pratensis* Orton, and 110. *P. subviscida* (Peck) Kauff.

Key to species

- 1a. Spores large, more than 9.9 μm long. 2
- 1b. Spores small, not more than 9.9 μm long. 3
- 2a. Cheilocystidia sublageniform, non-mucronate. Pellicle of the pileus separable. Species known only from Europe. 109. *P. pratensis*
- 2b. Cheilocystidia fusoid-ampullaceous and mucronate. Pellicle of the pileus not separable. Species known only from New Zealand. 108. *P. novae-zelandiae*
- 3a. Pileus with a separable pellicle. 4
- 3b. Pileus without a separable pellicle. 5
- 4a. Spores large, 7-10 μm long. 107. *P. muscorum*
- 4b. Spores small, 6-8.5 μm long. 109. *P. subviscida*
- 5a. Cheilocystidia large and thick, 22-23 (-40) $\times$ 7.7-8.8 (-12) μm 104. *P. apiculosa*
- 5b. Cheilocystidia small and narrow, 17.6-28.6 $\times$ 3-6.6 μm 6
- 6a. Growing on soil in lawns. Veil poorly developed in young stages. Known only from United States. 105. *P. castanella* var. *castanella*
- 6b. Growing on rotten wood in *Quercus* forests. Veil well developed in young stages. Known only from Colombia (South America). 106. *P. castanella* var. *subhyperella*

104. *Psilocybe apiculosa* Orton *Not. Royal Bot. Gard.* 29: 118, 1969.

Figs. 515-516

Pileus 6-20 mm in diam., convex, often obtusely umbonate especially when young, then more or less plane, slightly viscid but without separable pellicle, even but margin slightly striate when moist, glabrous, but margin with appressed fibrils or

appendiculate patches of the veil at first, hygrophanous, deep tawny honey or burnt sienna at first, then ochraceous-honey, often with a more yellow margin, drying creamy or pale ochraceous from the center outwards but sometimes remaining darker toward the disc.

Lamellae adnate or short subdecurrent, pale to dark brown violaceous with whitish and subfloccose or subdenticulate edges.

Stipe 15-30 $\times$ 0.5-1.5 mm, equal or slightly thickened at apex, usually bubillose, often flexuose, ochraceous honey or tawny honey like the cap, soon becoming bay from the base up, but apex remaining paler or sometimes slightly redder.

Veil cortinate then as appressed white to pale buff or yellowish fibrillose ring-zone, which usually disappears with age leaving only remnants on the stipe and margin of the pileus.

Context concolorous, drying whitish or pale yellowish in center of cap and stipe. Odor none or faintly pleasant.

Spores 6-7.7 (-8.8) $\times$ 4.4-4.9 $\times$ 3.8-4.4 μm , subellipsoid both in face and side view, or somewhat lentiform, with brownish yellow, thin-walls (no more than 0.5 μm thick), and a narrow apical germ pore.

Basidia 26-30 $\times$ 7-8 μm , 4-spored, hyaline and ventricose.

Pleurocystidia absent.

Cheilocystidia 22-23 (-40) $\times$ 7.7-8.8 (-12) μm , lageniform with flexuose or undulating neck, 3-4 μm diam., sometimes with a hyaline and viscous drop at the apex.

Subhymenium seemingly subcellular with short globose elements, brownish pale. Trama parallel, with hyaline or brownish hyphae up to 11 μm diam. Cuticle formed by a subgelatinous hyaline layer, with elongated hyphae, 2-4 μm diam., not conspicuously incrustated on the walls. Hypodermium with elongated hyphae 4-20 μm diam. Lactiferous hyphae yellow in the hypodermium, 2.5-4.4 μm diam., some with septa. Clamp connections present.

HABITAT AND DISTRIBUTION. Gregarious on soil in grassland. Fruiting in September. Known from Great Britain and Sweden.

STUDIED MATERIAL. GREAT BRITAIN, Malham, Yorks, Orton 2351 (Type E, Isotype at K).

SWEDEN, Smaland, Femsjo, Lundell & Haglund 5460 (UPS as *P. physaloides*).

DISCUSSION. This species is close to *P. castanella* Peck var. *castanella*, but the size of the cheilocystidia easily separates both fungi. The record from Sweden is new, but probably this species is largely distributed throughout Europe. Bon (1977) reported *P. apiculosa* from France. It is easy to mistake this species with *P. crobula* (Pers. ex Fr.) M. Lange ex Sing., *P. physaloides* (Fr. ex Mér.) Qué. and related species, because of similarities in the fruit body, but the form of the spores separate *P. apiculosa*.

The name of the species refers to the lack of a pellicle on the pileus in contrast to *P. pelliculosa* (Smith) Sing. & Smith (a species that belongs to Section *Semilanceatae*).

105. *Psilocybe castanella* Peck *Bull., N.Y. State Mus.* 1: 7, 1887, var. *castanella*
P. californica Earle, *Bull. N.Y. Bot. Gard.* 3: 301. 1904.

Figs. 502-503 & 506-508

Pileus (8-) 10-20 (-30) mm in diam., convex to subumbonate or campanulate, expanding to somewhat plane, with the disc depressed in age, glabrous or with silky remains of the veil at the margin, even or slightly striate at the margin when moist, lubricous or subviscid, pellicle not separable, hygrophanous, dark chestnut color or reddish brown to pinkish tan or orange brown, fading to pallid tan, ochraceous or straw-colored.

Lamellae broadly adnate to somewhat decurrent, pale brown, becoming dark reddish brown to dark violaceous brown or brown chocolate, with concolorous and even edges.

Stipe (25-) 30-50 × (1-) 2-3 μ m, equal or slightly enlarged above, hollow or stuffed, cartilaginous, pale or more or less concolorous with pileus, slightly covered by appressed or floccose fibrils from the veil, soon smooth; lower portion often covered by appressed white mycelium.

Veil cortinate but poorly developed in adults, except for the appressed or floccose silky fibrils mentioned above, not forming annulus even in young stages.

Context thin and pliant, brownish or pallid. Odor and taste not distinctive or mild.

Spores (6-) 6.7-7.5 (-8.2) × (3.5-) 4.5-5.2 μ m, subellipsoid both in face and side view, pale yellowish brown to dark, thin walled, with a small apical pore.

Basidia 18-22 × 6-7.5 μ m, 4-spored, hyaline, subventricose.

Pleurocystidia absent.

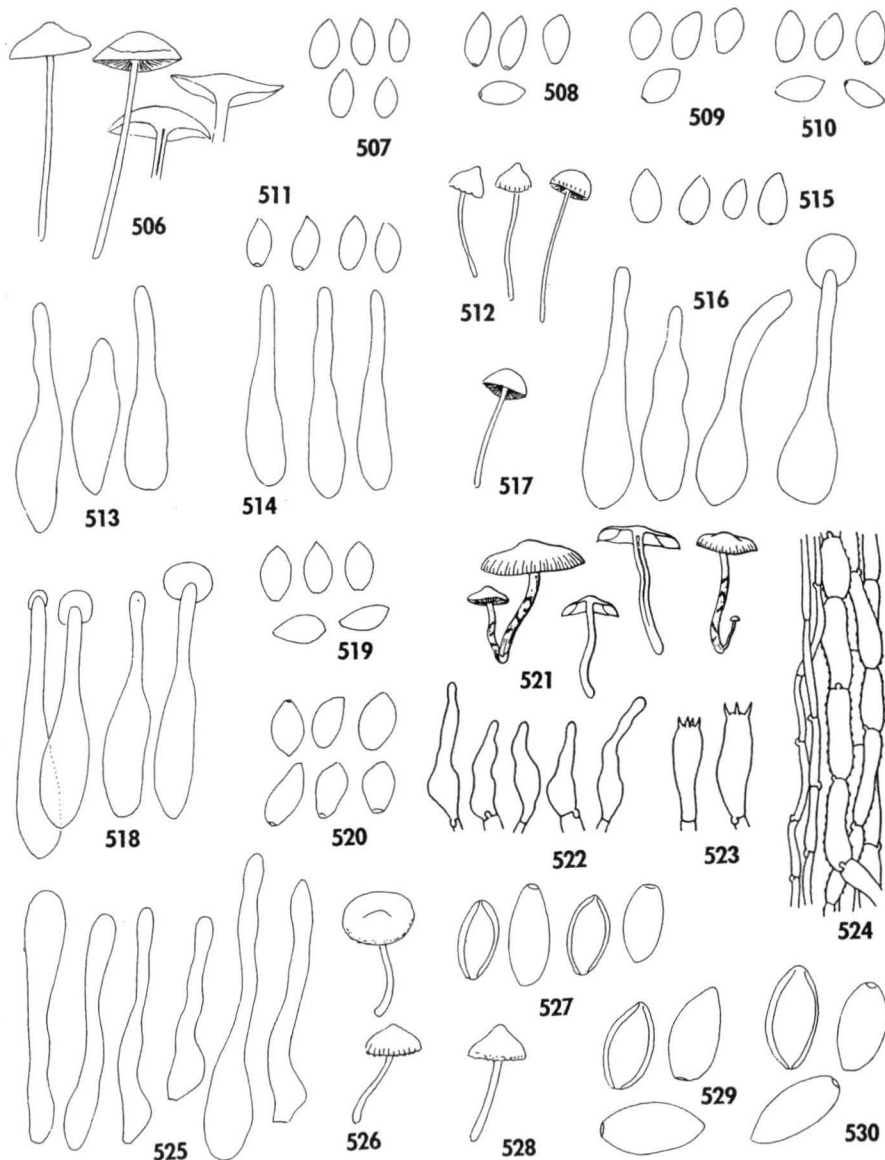


Plate 35: Figs. 506-530. - Several species of *Psilocybe*. 506-508: *P. castanella* var. *castanella*, 506: Carpophores, 507-508: Spores (506-507: type of *P. californica*; 508: type). 509: *P. castanella* var. *subhyperella*, Spores (type). 510-514: *P. subviscida*, 510-511: Spores, 512: Carpophores, 513-514: Cheilocystidia (510 & 513: type of *P. grammicola*; 511-512 & 514: type). 515-516: *P. apelluculosa*, 515: Spores, 516: Cheilocystidia (all from the type). 517-519: *P. muscorum*, 517: Carpophore, 518: Cheilocystidia, 519: Spores (all from the type). 520-523: *P. novae-zelandiae*, 520: Spores, 521: Carpophores, 522: Cheilocystidia, 523: Basidia, 524: Pileus (all from the type). 525-531: *P. sabulosa*, 525: Cheilocystidia, 526: Carpophores, 527: Spores, 528: Carpophore, 529-530: Spores (525-527: type; 528-529: type of *P. squarrosipes*; 530: type of *Stropharia dunicola*).

Cheilocystidia 18-24 (-28) $\times$ 3-5 (-6) μm , abundant, forming a sterile band, hyaline, lageniform or sublageniform with flexuous neck, 2-3 μm diam., apex obtuse often with an adhering drop of a hyaline mucilaginous substance

Subhymenium seemingly subcellular with short elements, hyaline to brownish. Trama parallel, yellowish brown or more tawny next to the subhymenium. Epicutis with a thin subgelatinous hyaline pellicle, formed by narrow hyaline hyphae. Hypodermium hyaline to brownish, formed with elongated hyphae. Clamp connections present.

HABITAT AND DISTRIBUTION. Gregarious to subcaespitose on roadsides, grassy areas or lawns, on rich soil or on grass leaves. Known only from California and New York (U.S.A.).

STUDIED MATERIAL. United States, California, Santa Clara, Stanford University Campus, *Baker 152* (NY Type of *P. californica*, Isotypes at FH, PC & UPS). Santa Barbara, *Hern* s.n. (ENCB). Berkeley, *Morse M-606* (BPI); *Morse* s.n. (Feb. 1, 1940) (MICH). New York, Renselaer, *Peck* s.n. (NYS); Sandlake *Peck* s.n. (NYS Type).

DISCUSSION. This species is close to *P. apeliculosa* Orton and distinguished from it only on the size of the cheilocystidia (see the key). Smith (1948) discussed the type of *P. castanella* and considered *P. californica* Earle a synonym. *P. subhyperella* Sing. may be a synonym of *P. castanella*, but for the moment it is considered it as a variety growing on rotten wood, as will be discuss below.

The name of the species probably refers to the chestnut color of the pileus.

106. *Psilocybe castanella* var. *subhyperella* (Sing.) Guzmán, comb. nov.

Figs. 504 & 509

P. subhyperella Sing., *Sydowia* 7: 83, 1973.

This variety apparently has the same taxonomic features as the type variety, except that the veil is better developed in the young stages, the fruit body is smaller (pileus 6-14 mm diam.) and the habitat is on rotten wood in a *Quercus* forest, in Colombia.

HABITAT AND DISTRIBUTION. Scattered on rotten wood, in a *Quercus* forest. Known only from the type locality. Fruiting in July.

STUDIED MATERIAL. COLOMBIA, Cundinamarca, Salto de Tequendama, *Singer B-3502* (BAFC Type).

DISCUSSION. Singer (1973) collected this fungus in July and pointed out the type in F Herbarium (then probably the collection at BAFC is an isotype).

The name of this variety probably refers to the little carpophore growing on the substratum (*hyper*: over; *ella*, diminutive).

107. *Psilocybe muscorum* (Orton) Moser in Gams, *Kleine Kryptogamenfl. II* b/2, p. 239, 1967.

Figs. 517-519

Deconica muscorum Orton, *Trans. Brit. Myc. Soc.* 43: 225, 1960.

Pileus 5-15 (-20) mm in diam., convex to somewhat plane or expanded, often umbonate, sometimes becoming slightly depressed, glabrous and even striate at the margin when moist, at first covered at the margin with fugaceous white remnant from the veil, viscid, with a separable pellicle; hygrophanous, chestnut to brown, or honey, or ochraceous-honey, drying from center to pale yellowish ochraceous, or greyish ochraceous.

Lamellae adnate or subdecurrent, clay-whitish then clay-umber, or pale snuff brown, finally violaceous-umber or pale chocolate-brown, with whitish slightly flocculose and fimbriate edges.

Stipe 12-30 $\times$ 1-2 mm, equal or attenuate downwards, sometimes slightly bulbous, hollow, whitish, soon ochraceous-honey to grey brown, but darker or reddish brown at the base, pruinose, covered with whitish fibrils, white mycelium at the base.

Veil cortinate and white, soon evanescent, only forming scattered patches on lower stem, but no annulus.

Context somewhat concolorous with pileus, drying paler. Odor and taste none.

Spores (7-) 7.7-9 (-10) $\times$ 4.4-5.5 $\times$ 3.8-5 μm , subellipsoid or slightly rhomboid in face view, subellipsoid in side view, thin walled, pale yellowish brown, with a narrow plane germ pore, up to 1 μm .

Basidia 28-34 $\times$ 6.6-7.7 μm , 4-spored, hyaline, ventricose.

Pleurocystidia absent.

Cheilocystidia (24-) 27-38 $\times$ (4.5-) 5.5-9 μm , obclavate or lageniform, with long neck 2-4 μm broad, hyaline, thin walled, abundant, forming a sterile band.

Subhymenium subhyaline or hyaline, with more or less interwoven elongated or globose thin elements, somewhat incrustate. Trama regular, hyaline. Epicutis formed by a well hyaline gelatinous layer of elongated thin hyphae, 2.2-4 μm broad. Hypodermium hyaline, like the subhymenium. Clamp connections present.

HABITAT AND DISTRIBUTION. Scattered on moss and lichens, on burn mossy ground or among grass on sanddunes or grasslands. Fruiting in autumn in Great Britain or in spring in France. Known only from these European countries.

STUDIED MATERIAL. GREAT BRITAIN, Studland, Dorset, *Orton 1517* (E Type). FRANCE, Roost Warendin, *Bon 70591* (Herb. Bon as *P. pratensis*).

DISCUSSION. This species is very close to *P. subviscida* (Peck) Kauff. but it seems that a small difference in the size of the spores is the only separation between both. It is probably that *P. muscorum* is a form of *P. subviscida*. According Orton (1960), Moser (1967) and Dennis *et al.* (1974) *P. muscorum* is *P. physaloides* ss. Ricken, and

ss. Moser, but non ss. Cooke, ss. J. Lange, and ss. Möller. The material collected by Nathorst-Windahl (in GB 5997 as *P. muscorum*) from Sweden is *P. montana*; the same with Bon's specimens from Switzerland. Bresinsky & Haad (1976) reported *P. muscorum* from Germany, and Bon (1977) from France. Høiland first reported *P. muscorum* from Norway, but later (1978) he appointed that this is *P. montana*. He presented a description of *P. muscorum* based in a study of the type. He stated that the separable pellicle of the pileus used by Orton (1960, 1969) and Moser (1967) as a taxonomic feature is a vague character. See also discussion of *P. bullacea* (Bull. ex Fr.) Kumm.

In connection with the habitat, *P. muscorum* is very close to *P. montana*, because both species typically grow on mosses. The name of *P. muscorum* means moss.

108. *Psilocybe novae-zelandiae* Guzmán & Horak *Sydowia* 31: 51, 1978.

Figs. 520-523

Pileus (3-) 15-25 mm in diam., hemispherical or convex when young, becoming umbonate when expanded to somewhat plane with disk depressed in aged carpophores, hygrophanous, dark brown or fuscous when moist, fading to orange-brown in dried specimens, glabrous, strongly striate towards margin, subviscid, cuticle not separable.

Lamellae broadly adnate, densely crowded, pale rust brown when young, turning deep brown or fuscous in mature specimens, edge concolorous, occasionally fibrillate.

Stipe (10-) 30-40 × (1-) 2-3 mm, cylindrical, equal, pale brown or concolorous with pileus, dry, hollow, often curved, covered with whitish appressed fibrils or several distinct belts.

Veil cortinate, soon evanescent except for the appressed fibrils in the adults, not forming annulus.

Context pliant, pale brown, unchanging. Odor and taste not distinctive.

Spore print violet brown.

Spores (8-) 10-11 (-12) × (5.5-) 6-7 (-7.5) × 3.5-5.5 μm, subellipsoid or ellipsoid in both face and side view, yellowish brown, thin-walled (up to 0.5 μm thick), apiculus and germ pore distinct.

Basidia 22-28 × 6-7.5 μm, 4-spored, hyaline, subcylindric, occasionally with a median constriction.

Pleurocystidia absent.

Cheilocystidia (16.5-) 25-33 × (4.5-) 6.5-9 μm, abundant, hyaline, varying between fusoid-ampullaceous and mucronate, with a short or long neck, somewhat flexuous 2.2-3.8 μm diam.

Subhymenial subcellular, hyphae encrusted with yellow pigment, mainly in the

spaces between the hyphae. Trama regular, hyaline. Epicutis a thin layer of subgelatinized hyphae, irregularly encrusted with brownish yellow pigment, rarely having lactiferous hyphae with orange-brown plasmatic pigment. Hypodermium more or less like to the subhymenium, hyaline to brownish. Clamp connections present.

HABITAT AND DISTRIBUTION. Single or caespitose in small groups on soil, under *Nothofagus cliffortioides* var. *solandri* and *N. fusca*. Known only from New Zealand.

STUDIED MATERIAL. NEW ZEALAND, Canterbury, Mt. Grey, Kowai Bush, Horak s.n. (15-IX-1967) (Type PDD 27132; Isotypes in ZT 67/104 and ENCB).

DISCUSSION. The spores of this species are the same as *P. pratensis* Orton from Great Britain, but both species differ in the form of the cheilocystidia, which are more lageniform in *P. pratensis*, as well as in the non-separable cuticle of *P. novae-zelandiae*. The incrustated subhymenium of this species is somewhat similar to *P. montana* (Pers. ex Fr.) Kumm. but that species has distinctly subrhomboid and thick walled spores, and belongs to Section *Psilocybe*.

109. *Psilocybe pratensis* Orton *Notes Roy. Bot. Gard.* 29: 120, 1969. Fig. 496

Pileus 5-20 mm in diam., convex to expanded, often obtuse umbonate, glabrous, subviscid, with a separable pellicle, with a smooth margin (at least when dry), hygrophanous, dark brown or rusty chocolate, drying tawny-ochraceous or ochraceous.

Lamellae broadly adnate or somewhat subdecurrent, pale gray or slightly olivaceous, then dark tinged purplish or chocolate brown, with floccose and pale edges.

Stipe 8-20 × 1-2.5 mm, equal or slightly swollen at the apex, hollow, clay buff or whitish, often becoming pinkish or reddish brown, especially above, white pruinose-fibrillose or subfloccose toward the apex from veil, then fibrillose-striate. Base with white tomentum.

Veil cortinate and poorly developed, as appressed white fibrils, not forming annulus.

Context whitish or pale in the pileus, odor and taste mild.

Spores (8.8-) 9.3-11 (-12.6) × 6.6-7.7 (-9) × 5.5-7.7 μm, subellipsoid or sub-lentiform, both in face and side view, pale yellowish brown, thin walled (no more than 5 μm wide), with a narrow germ pore.

Basidia 24-30 × 6.6-9 μm, 4-spored, hyaline, subventricose.

Pleurocystidia absent.

Cheilocystidia 25-30 × 6-10 μm, more or less abundant, sublageniform, with a short or long neck, often flexuous, 2-4 μm diam.

Subhymenium subcellular with short globose elements, hyaline to yellowish, with orange brown pigment somewhat incrustated on the walls. Trama regular, subhyaline to brownish with incrustated pigment. Epicutis formed by a gelatinized thin layer with parallel hyphae, somewhat incrustated. Hypodermium incrustated, brownish to hyaline, with elongated to globose hyphae. Clamp connections present.

HABITAT AND DISTRIBUTION. Scattered on basic soil in sand dunes, among grasses. Probable known only from Great Britain. Fruiting in November and December. Orton (1969) considered this species as calcicole fungus.

STUDIED MATERIAL. GREAT BRITAIN, Scotland, Eastern Lothian, Dirleton, Brigs of Fidra, *Watling 282-C* (Type E).

DISCUSSION. This species is very close to *P. novae-zelandiae* Guzmán & Horak as was discussed above. *P. pratensis* was reported by Bon (1970; 1980) from France, with spores 9-11 (-12) $\times$ 6-7 μ m, and (8.5-) 9-11.5 (-12.5) $\times$ 6.5-7.5 μ m, respectively. But Orton (1969) described spores (8.5-) 9.5-12 $\times$ (5-) 5.5-7 μ m and he wrote: "Readily distinguished from other non-coprophilous species of Section *Deconica* by relatively large spores". However, Orton stated: "This description is still somewhat imperfect on account of the scanty material available". He did not describe the trama, subhymenium, epicutis and hypodermium. This species is that considered first by Orton (1960) as "taxonomic sp. 2".

The name of the species refers to the praticolous habitat of this fungus.

110. *Psilocybe subviscida* (Peck) Kauff. *Agar. Mich.*, p. 275, 1918. Figs. 510-514

Deconica subviscida Peck, *Ann Rep. N.Y. State Mus.* 41: 70, 1888.

D. graminicola Orton, *Not. Royal Bot. Gard.* 26: 49, 1964.

Psilocybe graminicola (Orton) Orton, *Not. Royal Bot. Garden* 29: 80, 1969.

P. graminicola (Orton) Sing., *Sydowia* 7: 83, 1973.

Pileus 5-12 (-20) mm in diam., more or less conic to convex or subcampanulate, then expanded to somewhat plane, often slightly umbonate, glabrous, subviscid or viscid, with a separable pellicle, slightly striate at the margin when moist or somewhat striate when dry, hygrophanous, pale chestnut, reddish tan, burnt sienna or dull tawny to amber or purplish amber, drying pale ochraceous to dull honey color from the center out, and sometimes with a tawny tinge especially around the center when partially dried, extreme margin often remaining dark for some time.

Lamellae adnate to slightly decurrent, whitish, clay-umber or dingy, then deep umber, violaceous umber or chocolate brown, edge white and flocculose at first.

Stipe 18-36 $\times$ 1-2 mm, equal or slightly thickened at base, hollow, brownish toward the base, whitish or pale above, covered by whitish or grayish fibrils from the veil, then more or less smooth or slightly silky striate, apex pruinose.

Veil poorly developed, annulus not formed, but in young specimens leaving white or whitish annular zone and scattered floccose patches below this, but both soon disappearing leaving fine appressed silky fibrils.

Context thin and pliant, concolorous with the pileus when fresh, drying reddish ochraceous to pale buff or whitish. Taste and odor absent or slightly fungal.

Spores (6-) 6.6-8 (-8.5) $\times$ 4.8-5.4 $\times$ 3.8-4.5 μ m, ellipsoid to somewhat ovoid, or very slightly lentiform both in face and side views, brownish yellow, thin walled (up to 0.5 μ m thick), with a narrow but plane germ pore.

Basidia 15-28 (-32) $\times$ 6-8 μ m, 4-spored, rarely 6-spored, hyaline, ventricose.

Pleurocystidia absent.

Cheilocystidia 20-40 (-50) $\times$ 5-9 μ m, abundant, hyaline, lageniform, but ventricose to ellipsoid at first, then with long and flexuous neck 2-3.5 μ m diam.

Subhymenium seemingly subcellular with short globose hyaline elements. Trama regular, brownish or subhyaline. Epicutis with a thin gelatinous pellicle or narrow (2-3 μ m diam.) hyaline hyphae. Hypodermium formed by more or less elongated or globose hyaline or pigmented (brownish yellow) hyphae, up to 7 μ m diam. Clamp connections present.

HABITAT AND DISTRIBUTION. Gregarious or scattered on soil, rich soil, in grassy lawns, or even on horse manure, edges of roads. Known from eastern U.S.A. and Great Britain. Fruiting in summer.

STUDIED MATERIAL. U.S.A., New York, Albany, Menands, *Peck s.n.* (NYS Type). GREAT BRITAIN, Scotland, Mid Yell, Shetland, *Orton 1518* (E Type of *Deconica graminicola*).

DISCUSSION. A study of both Peck's and Orton's types shows that these fungi are synonyms. Smith (1948) studied the type of *Deconica subviscida* and reported pleurocystidia. Smith wrote "the occurrence of pleurocystidia between the gills should not be given much emphasis. In many species such structures develop along the line where a new gill is forming and hence they could also be interpreted as cheilocystidia". Kauffman (1918) reported *P. subviscida* from Michigan. Murrill (1922b) described this species without any new information. Peck (1888) states this species does not have a separable pellicle on the pileus. However, Guzmán suspect that Peck studied more or less dried specimens, because upon studying Peck's type a gelatinous pellicle on the pileus can be clearly seen.

Lowe (1969) reported *P. subviscida* from British Colombia (Canada) and Cleland (1934-1935) reported this species from Australia (but Guzmán & Watling, 1978 did not record it). One collection from Tennessee (TENN 3952), identified by Hesler as *P. subviscida* is *Naematoloma* sp. because of the chrysocystidia. Other collection from Pennsylvania (at BPI), identified by Parker as *P. subviscida* agrees with *Panaeolus subbalteatus* (B. & Br.) Sacc. Singer (1973) did not discuss when making the combination of Orton's species in *Psilocybe*. *Deconica graminicola* Orton is considered a synonym of *P. subviscida* after the study of the type (in E); the macroscopic and microscopic taxonomic features of Orton's species agree well with the type of Peck's fungus. Orton (1964) reported spores 6-8.5 $\times$ 4.5-5.5 $\times$ 3.7-4.5 μ m, ellipsoid-amygdaliform slightly lentiform, and cheilocystidia sublageniform, 20-40 $\times$ 5-9 μ m, apex 2-3 μ m wide.

The name of *P. subviscida* refers to the subviscid pileus.

Section *Atrobrunneae* Sing., Sydowia 2: 37, 1948.

Spores ellipsoid or subellipsoid, thick walled (up to 1.5 μm thick). Pleurocystidia present or absent. Species without annulus and not bluing. Common in temperate and subtropical regions. Type species *P. atrobrunnea* (Lasch) Gill.

Species considered: 111. *P. angustispora* Smith, 112. *P. atrobrunnea* (Lasch) Gill., 113. *P. borealis* Guzmán, 114. *P. chilensis* Sing., 115. *P. clavatum* Guzmán, 116. *P. peruviana* Sing., 117. *P. sabulosa* Peck, and 118. *P. subcoprophila* (Britz.) Sacc. It is probable that *P. marthae* Sing. belongs to this Section (see the discussion of that species in Sect. *Psilocybe*).

Singer (1975) only considered in this Section: *P. atrobrunnea*, *P. fuegiana* (Horak) Sing., and with doubt, *Geophila tenax* (Fr.) Kühn. & Romag., this latter is a doubtful species, and *P. fuegiana* is consider in the present monograph in Section *Coprophilae* for its subhexagonal spores.

Key to the species

- 1a. Spores large, more than 10 μm long. 2
- 1b. Spores small, no more than 10 μm long. 5
- 2a. Growing only on *Sphagnum* bogs. 112. *P. atrobrunnea*
- 2b. Growing on dung, or on sand or sandy soil. 3
- 3a. Growing on sandy soil or on sand. Pileus (10-) 15-30 (-44)mm in diam.
..... 117. *P. sabulosa*
- 3b. Growing on dung. Pileus generally smaller than 20 mm in diam. 4
- 4a. Cheilocystidia 24-40 $\times$ 4-8 μm . Spores (12-) 13.2-14.2 (-16.5) (-18.7) $\times$ (5-) 6.6-7.7 (-8.8) μm 111. *P. angustispora*
- 4b. Cheilocystidia 33-40 (-50) $\times$ 8.8-10 (-12) μm . Spores (13-) 14-18 (-19) (-22) $\times$ (6.5-) 7.7-8.8 (-9.9) μm 118. *P. subcoprophila*
- 5a. Pleurocystidia absent. Species known only from a coniferous forest in northern Mexico, growing on humus. 113. *P. borealis*
- 5b. Pleurocystidia present. 6
- 6a. Pleurocystidia large, 34-60 μm long, thin or thick walled. Species known only from a subtropical forest of Mexico, growing on soil. 115. *P. clavatum*
- 6b. Pleurocystidia smaller than 34 μm long, and thin walled. 7
- 7a. Cheilocystidia 10-25 $\times$ 4.5-8 μm . Pleurocystidia 20-34 $\times$ 6.5-11 μm . Species known only from Chile, growing on debris or rotting wood. ... 114. *P. chilensis*
- 7b. Cheilocystidia 25-27 $\times$ 5.2-6.5 μm . Pleurocystidia 16-32 $\times$ 10-13.5 μm . Species known only from Peru, growing on moss carpet. ... 116. *P. peruviana*

111. *Psilocybe angustispora* Smith in Smith & Hesler, *Jour. Elisha Mitch. Sci. Soc.* 62: 193, 1946. Figs. 546-548

Pileus (2-) 5-15 mm in diam., conic to campanulate, glabrous, but margin at first decorated with minute white fibrillose flecks from the remains of the veil; surface even to somewhat striate at the margin when moist, viscid, hygrophanous, cinnamon brown or brown, fading to pale pinkish tan, brownish or yellowish brown.

Lamellae broad adnate or subadnate to subdecurrent, dark purple brown to violaceous blackish brown, but with whitish fimbriate edges.

Stipe (10-) 20-40 × (0.5-) 1-2 mm, equal or somewhat subbulbous, delicate, somewhat flexuous, whitish to pallid pinkish or reddish brown, covered at first with whitish fibrils. Base with white floccose mycelium.

Veil arachnoid and white in young stages, soon evanescent and inconspicuous except for the floccose appressed fibrils on pileus and stipe.

Context pliant, pallid to concolorous with pileus. Odor and taste slightly fungoid or mild.

Spores (12-) 13.2-14.3 (-16.5) (-18.7!) × (5-) 6.6-7.7 (-8.8) μm, subellipsoid or narrowly ellipsoid, but not subhexagonal, thick walled, yellowish brown with a distinct apical germ pore.

Basidia 15-30 × 7-9 μm, 4-spored, hyaline, subventricose; sterigmata up to 2.5 μm long.

Pleurocystidia absent.

Cheilocystidia 24-40 × 4-8 μm, abundant, sublageniform or lageniform, thin walled, with a narrow and long neck 1.5-2 μm; often capped with hyaline mucilage (which soon dissolves in KOH).

Subhymenium seemingly subcellular, subhyaline to yellowish with somewhat incrustated brownish pigment on the walls. Trama parallel, with yellowish brown to hyaline more or less thin walled hyphae, 4.4-9 μm broad. Epicutis with a thick hyaline gelatinous pellicle, formed by elongated parallel hyphae. Hypodermium hyaline with reddish brown or cinnamon brown pigment, incrustated like the subhymenium. Clamp connections present.

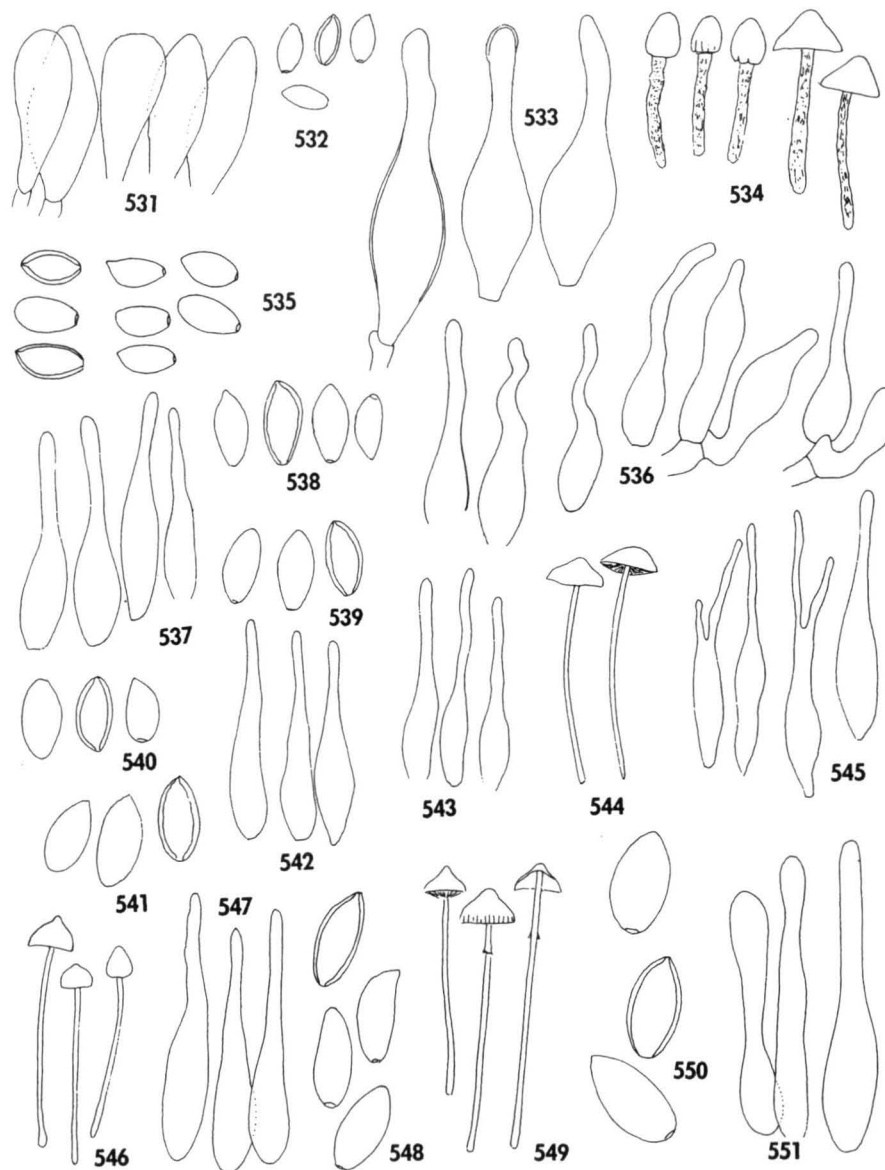


Plate 36: Figs. 531-551. - Several species of *Psilocybe*. 531-533: *P. clavatum*, 531: Pleurocystidia, 532: Spores, 533: Cheilocystidia (all from the type). 534-536: *P. borealis*, 534: Carpophores, 535: Spores, 536: Cheilocystidia (all from the type). 537-541: *P. atrobrunnea*, 537: Cheilocystidia, 538-541: Spores, 542-543: Cheilocystidia, 544: Carpophores, 545: Cheilocystidia (537-538: Smith 4920; 539 & 544-545: type of *P. fuscofulva*; 540 & 543: type of *P. nigrella*; 541 & 542: Horak 65-15). 546-548: *P. angustispora*; 546: Carpophores, 547: Cheilocystidia, 548: Spores (all from Ott 75-17). 549-551: *P. luteonitens*, 549: Carpophores, 550: Spores, 551: Cheilocystidia (all from type of *Stropharia umbonatescens*).

HABITAT AND DISTRIBUTION. Single or scattered on dung (cattle, sheep, horse or wild animals such as elk and marmot). Fruiting during spring to fall. Known only from northwestern U.S.A.

STUDIED MATERIAL. U.S.A., State of Washington, Cispus, *Ott 75-17* (ENCB). Lower Tahoma Creek, Mt. Rainier Nat. Park, *Smith 30232* (MICH). Idaho, *Smith 65847* (MICH). Colorado, Ophir, *Smith 51493* (MICH).

DISCUSSION. *P. angustispora* is close related to *P. subcoprophila* (Britz.) Sacc., but differs mainly in the size of the cheilocystidia, 33-40 (-50) $\times$ 8.8-10 (-12) μ m, and spores, (13-) 14-18 (-19) (-22) $\times$ (6.5-) 7.7-8.8 (-9.9) μ m in that species. On the other hand *P. subcoprophila* is unknown in North America, except in Greenland. Smith (in Smith & Hesler, 1946) stated that the first collection was made in May 1939, but he designated as type *Smith 14866* from Lake Mills, Olympia Mountains of Washington, collected in July, 1939. He pointed out that another collection made in 1941 was lost. Unfortunately these materials were not studied by the author of this monograph but only three collections collected by Dr. Smith (mentioned in the Studied material) and determined as *Psilocybe* sp. in MICH, that agree well with the original description.

The name of the species refers to the narrow and long spores so typical of this fungus.

112. *Psilocybe atrobrunnea* (Lasch) Gill. *Les Hymen.*, p. 586, 1878.

Figs. 537-545 & 687

Agaricus atrobrunneus Lasch, *Linnaea* 3, No. 423, 1828.
Psilocybe fuscofulva Peck, *Bull. N.Y. State Mus.* 1: 7, 1887.
P. nigrella Peck, *Idem*, 139: 28, 1910.
P. turficola Favre, *Bull. Soc. Myc. Fr.* 55: 196, 1939.

Pileus (10-) 20-40 (-60) mm in diam., convex to campanulate, or umbonate, usually mammillate with a short papilla, becoming subplane, glabrous, but when young faintly white-fibrillose from the remnants of a rudimentary veil, but margin enrolled at first without veil remnants, at least no conspicuous, surface even but somewhat striate at the margin when moist, viscid with a thin separable pellicle, hygrophanous, dark reddish brown at first, usually blackish reddish vinaceous or brown in age or when moist, fading to brownish or pale reddish brown to ochraceous buff.

Lamellae adnate or adnexed, pallid cinnamon brown when young to dark purplish brown or violaceous brown in age, with white and fimbriate edges.

Stipe 80-180 $\times$ (2.5-) 4-5 (-6) mm, equal and flexuous, or fistulose frequently subbulbous or subpyriform at the base, stuffed by a white pith but soon hollow, cartilaginous and tough, at first more or less evenly covered with a coating of appressed white fibrils; often with white, mycelial felt at the base; apex pruinose, surface pale reddish brown with zones, more reddish or blackish and white from the veil fibrils.

Veil more or less developed in young stages as white fibrils soon evanescent except for the fibrils on the stipe, but not forming any annulus.

Context pliant in the pileus and fairly tough in the stipe, dark brown and watery at first, fading to cinnamon buff. Odor faint. Taste slightly fungoid or none.

Spore print dark brown violaceous.

Spores (8-) 9-12 (-14) (-15!) $\times$ 5-7 (-9) $\times$ 5-6.6 μ m, ellipsoid, both in face and side view, yellowish brown, thick walled (0.7-1.5 μ m thick), with a plane somewhat narrow germ pore, up to 1 μ m wide.

Basidia 22-30 $\times$ 7-8.8 μ m, 4-spored, hyaline, subventricose or subpyriform.

Pleurocystidia absent or scarce, or inconspicuous, somewhat imbedded in hymenium, 30-38 $\times$ 4-6 (-8) μ m, similar to the cheilocystidia.

Cheilocystidia 18-30 (-36) $\times$ 4-7 μ m, hyaline, lageniform or fusoid-ventricose with a long neck, 1.5-2.5 μ m broad, abundant, forming a sterile band. In old specimens it is common to observe the cheilocystidia distinctly and irregularly branched.

Subhymenium subcellular formed by globose compact elements, subhyaline, with conspicuous reddish brown or brown-yellow pigment irregularly incrustated on the hyphal walls. Trama parallel, pale brown to hyaline, with hyphae 9-12 μ m broad, somewhat incrustated as in the subhymenium. Epicutis as a thin gelatinous pellicle, formed by filamentous hyaline to brown-yellow hyphae. Hypodermium formed by globose elements, 8-20 μ m wide, irregularly incrustated with brownish pigment. Clamp connections present.

HABITAT AND DISTRIBUTION. Gregarious to scattered in *Spagnum* bogs or moors, or along their edges, in coniferous or deciduous forest zones. Known only from eastern United States and from Central and North Europe. Fruiting September-October.

STUDIED MATERIAL. U.S.A., Maine, Oxford, Canton Point, *Smith 15404* (MICH). Michigan, *Kauffman 1906* (MICH); *Smith 64660* (MICH). Livingston, George Reserve, *Homola 1151* (MICH). Washtemaw, Mud Lake Bog, Whitmore Lake, *Smith 4920*; *11029*, *15489* & *18920* (MICH); *14944* (TENN 28888); *15489* (UPS). New York, Albany, Karner, *Peck* s.n. (NYS as *P. dichroa*); *Peck* s.n. (NYS Type of *P. fuscofulva*); *Peck* s.n. (NYS Type of *P. nigrella*).

CZECHOSLOVAKIA, Without locality, *Charvat* s.n. (PR 515090 as *P. dichroa*). Cadca, Rakova, *Kuthan* s.n. (4-X-72) (BRA as *P. maire*). Mala-Fatra, Turany, *Kuthan* s.n. (22-IX-74) (BRA as *P. maire*). Skycov, Utočník, *Kuthan* s.n. (20-X-74) (BRA as *P. maire*). Salomanovice, Bohemia meridionalis, *Kubica* s.n. (28-8-52) (PR 703983).

GREAT BRITAIN, Newcalwe, Somomet, *Smith 63157* (MICH).

FINLAND, Helsinki, *Tuomikoski* s.n. (H); *Frey* s.n. (27-IX-36) (H as *P. bullacea*). Pielisjärvi, Koli *Tuomikoski* s.n. (H). Robdainen, St. Lappi, *Saltin* s.n. (Oct. 11, 1957) (H). Tavastia, Tammda, *Karsten 1560* (H as *P. nitidum*).

FRANCE, Jura, Chenootte, *Favre* s.n. (Sept. 18, 1937) (MICH, Isotype of *P. turficola*).

GERMANY, Baden-Württemberg, Schwarzwald, Pfaffenweiler, *Horak* s.n. (ZT 65/15 as *P. turficola*).

POLAND, Lipsk, *Babos* s.n. (3-IX-1966) (BP).

SWEDEN, Smaland, Femsjö, *Lundell 1144 (Fungi Exsiccati Suecici)* (UPS, and several other herbaria, as *P. dichroa*); 3687 (UPS as *P. dichroa*); *Lundell & Haglund 2869 & 5593* (UPS as *P. dichroa*).

DISCUSSION. According to Leung *et al.* (1965) *P. atrobrunnea* does not have psilocin, but *P. atrobrunnea* reported by Høiland (1978) from Norway has psilocybin and maybe this Norway's fungus is another unknown species, because Høiland described spores $(7.5-8.2-10.5 (-12.5) \times 4.5-6 \times 4.5-5.2 (-6) \mu\text{m}$, cheilocystidia $12-25.5 \times 4.5-6.7 \mu\text{m}$, and pleurocystidia inconspicuous and context with strong farinaceous smell, features not belong to *P. atrobrunnea*. Høiland's species is close to *P. serbica* Moser & Horak or *P. callosa* (Fr. ex Fr.) Quél., but differs in the size of the cheilocystidia. Kauffman (1918) reported a farinaceous odor in *P. atrobrunnea*. It seems that this species is confused several times with some bluing species of the Section *Semilanceatae* as *P. callosa* or *P. serbica* or with *P. cyanescens* Wakef. and *P. maire* Sing. of the Section *Cyanescens*. See discussion of *P. serbica*.

Concerning to the synonym, it is not consider *P. dichroa* Karst. as synonym contrary to Smith's opinion (1949) and Singer's opinion (1975), because Karsten's species was based on *Agaricus dichrous* Pers., a doubtful species as will be discuss. It seems that Karsten's fungus belongs to *Naematoloma subericaceum* (Fr.) Sing. according to Kühner & Romagnesi (1953). Peck's materials, variously identified as *P. fuscofulva* and *P. nigrella*, were first identified by him as *P. dichroa*. *P. fuscofulva* Peck, *P. nigrella* Peck and *P. turficola* Favre are considered synonyms with *P. atrobrunnea* base on a study of the types. Of these, *P. nigrella* is considered for first time as synonym; the others two were considered synonyms by Smith (1949) and Singer (1975). However, Schulmann (1960) considered *P. atrobrunnea* with spores $9-11 \mu\text{m}$ long and *P. turficola* with spores $10-13 \mu\text{m}$. Charles (1931) considered *P. fuscofulva* related to a possible disease on the cranberry. All these Peck's and Favre's fungi, as is typical in *P. atrobrunnea*, grow on *Sphagnum* in moors or bogs.

It is interesting to see the relationships of *P. atrobrunnea* with the group *Naematoloma*, Sect. *Psilocyboideis* Sing., as *N. dispersum* Karst., *N. udum* (Pers. ex Fr.) Karst. *N. ericaceum* (Pers. ex Fr.) Sing., *P. subericaceum* (Fr.) Sing., and others. All these fungi grow on *Sphagnum* or *Polytrichum* in marshy prairies or bogs, as does *P. atrobrunnea*. Even a orangish brown-yellow pigment in the context of the pileus is common in all these species, and KOH reaction reddish vinaceous brown on the pileus is constant in these species, including *P. atrobrunnea*.

P. atrobrunnea has interesting relationships with *P. paupera* Sing. concerning to the habitat; both species grow on *Sphagnum* bogs. Singer's species differs from *P. atrobrunnea* in the brownish pleurocystidia and cheilocystidia, as well as in the large spores.

Reports of *P. atrobrunnea* from North America, besides Peck's Smith's, and Kauffman's reports mentioned before, are Murrill (1923) (as *P. dichroa*), and Graham (1944).

From Europe, besides Karsten's report discussed before, there are Ricken (1915-1920), Lange (1936; 1939, as *P. dichroa*), M. Lange (1948, as *P. turficola*), Favre (1939, 1960, as *P. turficola*), Kühner & Romagnesi (1953 as *Geophila turficola*), Moser (1967), Ricek (1969, as *P. turficola*) and Bresinsky & Haas (1976).

The name *atrobrunnea* refers to the dark color of the pileus (*ater*, black; *brunnea*, brown).

SELECTED ILLUSTRATIONS. Kauffman (1918, pl. LVI, left). Laplanche (1894) did not reported any iconography.

113. **Psilocybe borealis** Guzmán in Guzmán *et al.*, *Bol. Soc. Mex. Mic.* **11**: 27, 1977. Figs. 534-536

Pileus 7-18 mm in diam., convex to subcampanulate or subumbonate, glabrous, even, lubricous, hygrophanous, reddish brown fading to yellowish brown, margin somewhat thick and irregularly lobulate, without remains of the veil in the adults.

Lamellae adnate or adnexed, violaceous brown, with whitish and even to subfloccose edges.

Stipe 30-40 $\times$ 3-4 mm, equal, straight or flexuous, hollow, brownish, conspicuously covered by floccose fibrils from the veil.

Veil well developed in young stages as white and cortinate but soon evanescent except for the fibrils on the stipe, but without any annulus.

Context whitish, pliant in pileus, fibrous in stipe, unchanging in color. Odor and taste mild.

Spores $(7.1-7.7-8.8 (-9.9) \times (4.9-5.5-6 \mu\text{m}$, subellipsoid both in side and face view, moderately thick walled (up to $0.5 \mu\text{m}$), yellowish brown and with a broad germ pore.

Basidia $16-20 \times 5.5-7 \mu\text{m}$, 4-spored, hyaline, ventricose or somewhat subpyriform.

Pleurocystidia absent.

Cheilocystidia $17.6-28.6 \times 4.4-6.6 \mu\text{m}$, abundant, hyaline, lageniform or sublageniform, with flexuous neck $2.2-3.3 \mu\text{m}$ thick.

Subhymenium subcellular, with short globose elements, hyaline yellowish brown, pigment irregularly incrusting on the cells walls. Trama regular, hyaline, with thin walled hyphae, up to $22 \mu\text{m}$ diam. Epicutis as a thin subgelatinized layer with parallel elongated hyaline hyphae, $3-6 \mu\text{m}$ diam. Hypodermium with elongated to globose cells, hyaline to incrusting with brown pigment on the walls, $6-15 \mu\text{m}$ diam. Clamp connections present.

HABITAT AND DISTRIBUTION. Gregarious on humus, in a *Pseudotsuga* forest. Known only from the Northwestern Mexico. Fruiting in September.

STUDIED MATERIAL. MEXICO, State of Durango, Region of El Salto, road to Mazatlan, Puerto Buenos Aires, *Guzmán 3555* (Type ENCB; Isotype MICH).

DISCUSSION. The absence of pleurocystidia readily separates this species from the others of the Section. The subellipsoid spores place *P. borealis* in the Section *Atrobrunneae* instead of the Section *Psilocybe*, as the author once considered (Guzmán *et al.* 1977).

The name of the species refers to the Northern distribution of this species in Mexico, as well as for the habitat in a coniferous forest.

114. *Psilocybe chilensis* Sing. *Mycopath. & Mycol. Appl.* 26: 168, 1965.

Figs. 224 A-B & 232 B-C

Pileus 13-15 mm in diam., convex to plane or somewhat concave, but subpapillate, glabrous, even, with the margin slightly striate, hygrophanous, dark brownish ochraceous, fading to yellowish from the margin.

Lamellae adnexed to subdecurrent, dark brown, edges concolorous.

Stipe 28-30 × 1-1.5 mm, equal, somewhat flexuous, brownish to blackish toward the base, glabrous, with the base white because of the mycelium.

Veil poorly developed, present only as white fibrils soon evanescent. No annulus present.

Context thin, paler than the pileus, no odor or taste reported.

Spores 6-8.2 (-9.5) × 4.5-6 µm, subellipsoid both in side and face view, sometimes slightly subrhomboid in face view, moderately thick-walled (up to 1 µm thick), dark yellowish brown, with a more or less broad germ pore.

Basidia 13.5-18 × 6.8-7.7 µm, 4-spored, rarely 2-spored, hyaline, subventricose.

Pleurocystidia 20-34 × 10-12 µm, hyaline, thin walled, clavate or ventricose.

Cheilocystidia 10-25 × 4.5-8 µm, hyaline, lageniform or sublageniform, sometimes ventricose mucronate, neck flexuous, sometimes digitiform.

Subhymenium seemingly subcellular with short elements and hyphae, incrustated with brownish pigment on the walls. Trama regular, hyaline to incrustated, hyphae up to 18 µm diam. Epicutis as a subgelatinous layer, formed by thin, hyaline elongated hyphae. Hypodermium with incrustated elongated to subglobose brownish hyphae. Clamp connections present.

HABITAT AND DISTRIBUTION. Solitary on debris of rotting wood, in a mixed forest. Known only from the type locality. Fruiting in March.

STUDIED MATERIAL. CHILE, Valdivia, Cordillera Pelada, *Singer M-3241* (BAFC Type).

DISCUSSION. *P. chilensis* is closely related to *P. peruviana* Sing. from which it differs in size of the cheilocystidia and pleurocystidia, but as both taxa are based only on a single collection, respectively, more studies are necessary in order to establish the degree of variability in both, and verify their taxonomic position. Singer (1965) described pleurocystidia 22-25.5 × 6.5-11.8 µm.

115. *Psilocybe clavatum* Guzmán, sp. nov.

Figs. 531-533, 710-711.

Pileus 4-23 mm latus, convexus vel subumbonatus, margin substriatus, suboleosus vel sicco, hygrophanus, rufobrunneus, vel fulvus tabacinus deim lutescens. Lamellae adnatae vel subdecurrentes, brunneis purpurello tinctis. Stipe 22-45 × 1-3 mm, floccosus vel subfloccosus, rufobrunneus. Amullus nullo. Carne non caerulescente. Sporis (5.5-) 6.6-7.7 (-8.8) × 3.8-4.4 (-5.5) µm, subellipsoideis. Pleurocystidiis 34-60 × 7.7-14 µm, hyaline, lageniformis, tenuis vel crassus tunicata. Cheilocystidiis 20-34 × 8.8-11 µm, hyalinae, ventricosae vel fusoides. Hyphis epicutis subgelatiniscentibus. Hyphis fibuligeris. Ad caulis vel terram. Prope Totontepec, ad Oaxaca (Mexico). Typus: Jacobs 63 (ENCB).

Pileus 4-23 mm in diam., convex to subumbonate or subcampanulate, then more or less plane in the adults, glabrous, even but margin striate when moist, shiny, lubricous, hygrophanous, reddish-brown or orange brown, fading to yellowish brown or snuff brown, finally cream colored.

Lamellae adnate or subdecurrent, sienna fulvous to violaceous brown, edges concolorous.

Stipe 22-45 × 1-3 mm, equal or slightly thicker at the apex, hollow, covered by appressed white fibrils except at the apex; surface light sienna but downward reddish-brown to bay colored.

Veil rudimentary and fugacious, except for the appressed white fibrils on the stipe. No annulus is present.

Context concolorous in the pileus, thin, somewhat pliant, without any odor or taste.

Spores (5.5-) 6.6-7.7 (-8.8) × 3.8-4.4 (-5.5) µm, subellipsoid both in face and side view, thick walled, yellowish brown, with a broad germ pore.

Basidia 14-18.7 × 5.5-7.7 µm, 4-spored, hyaline, subcylindric or ventricose.

Pleurocystidia 34-60 × 7.7-14 µm, abundant, clavate or lageniform, neck long and flexuous, 3.3-7.7 µm broad, thin or moderately thick walled, hyaline or with the base brown yellowish.

Cheilocystidia 20-34 × 8.8-11 µm, abundant, hyaline, ventricose or fusoid, thin walled.

Subhymenium subcellular, with short globose elements, hyaline, irregularly incrustated with orange brown pigment on the walls. Trama regular, hyaline to dark yellowish brown, with thin walled hyphae, not more than 10 µm diam. Epicutis formed by a thin subgelatinous and hyaline layer, with elongated hyphae. Hypodermium brown to hyaline, with elongated hyphae, 8-15 µm diam. Clamp connections present.

HABITAT AND DISTRIBUTION. Gregarious on sandy soil or on stems of grasses or mosses. Fruiting in July. Known only from the type locality.

STUDIED MATERIAL. MEXICO, State of Oaxaca, near Totontepec, *Jacobs 63* (ENCB Type; Isotype NY).

DISCUSSION. The large thin to thick-walled clavate pleurocystidia separate readily this species from the others of the Section. It is close to *P. venezuelana* Dennis of the Section *Singerianae*, but that species has thin walled spores and is only known from high temperate mountains of Venezuela.

The name of the species refers to the clavate pleurocystidia.

116. *Psilocybe peruviana* Sing. *Mycologia* 51: 583, 1959.

Figs. 409 B-C

Pileus 5-7 mm in diam., convex to subumbonate but not papillate, finally with a depressed center, glabrous, even or translucently striate to sulcate, not viscid, hygrophanous, ferruginous buff over one half of the radius, over a melleous buff back ground to brownish.

Lamellae adnate, melleous argillaceous to somewhat concolorous with pileus; edges concolorous.

Stipe about 13×1 mm, equal, buff to slightly pallid, longitudinally silky.

Veil absent at least not in mature specimens.

Context thin, inodorous, concolorous with pileus.

Spores $6.7-7.5 (-8.5) \times 5.2-6 (-7.5) \mu\text{m}$, subrhomboid or subellipsoid in face view, subellipsoid in side view, pale yellowish-brown or olive melleous or dusky, thick walled, with a distinct truncate germ pore.

Basidia $22-26 \times 7.5-8.2 \mu\text{m}$, 4-spored, hyaline, clavate.

Pleurocystidia $16-32 \times 10-13.5 \mu\text{m}$, hyaline, subclavate or pyriform, thin walled, not very numerous.

Cheilocystidia $25-27 \times 5.2-6.5 \mu\text{m}$, hyaline, abundant, ampullaceous or ventricose with acute or obtuse tip, not incrustated.

Subhymenium subcellular with short elements, hyaline, moderately incrustated on the walls with ochraceous brown pigment. Trama regular, hyaline, somewhat incrustated with brownish pigment. Epicutis as a subgelatinous thin layer, with filamentous narrow walled hyphae. Hypodermium with short and subglobose elements, hyaline to moderately incrustating as in the subhymenium. Clamp connections present.

HABITAT AND DISTRIBUTION. Scattered in moss carpet under scrubs in semi-xerophytic conditions. Fruiting in fall. Known only from the type locality, at 3000 m elevation.

STUDIED MATERIAL. PERU, Dept. Cuzco, Lamay, *Singer B-3032* (BAFC Type).

DISCUSSION. Singer (1959b) pointed out the type is in LIL, but this material is almost destroyed. It is only a stipe and a mass of mosses, and has no pileus. Fortunately, Singer deposited two other specimens in BAFC which are here considered as the type. The spores and habitat place this species close to *P. montana* (Pers. ex Fr.) Kumm., but it differs in the pleurocystidia which are absent in that species. It is also close to *P. chilensis* Sing., but that species has lageniform, sublageniform, or sometimes ventricose mucronate cheilocystidia, $10-25 \times 4.5-8 \mu\text{m}$.

117. *Psilocybe sabulosa* Peck *Bull. Torrey Bot. Club* 24: 144, 1897. Figs. 525-531

Stropharia dunicola Speg., *An. Mus. Bs. As.* 6: 148, 1899.

Psilocybe dunicola (Speg.) Sing., *Mycopath. & Myc. Appl.* 34: 137, 1968.

P. squarrosipes Sing., *Mycologia* 51: 589, 1959.

Pileus (10-) 15-30 (-44) mm in diam., convex to umbonate, finally somewhat applanate or depressed around the broad umbo, glabrous and even or minutely subscrobiculate, not viscid, margin sometimes with small whitish appendages, hygrophanous, orange brown to ochraceous or fulvous-yellow, fading to brownish yellow or straw color.

Lamellae broadly adnate, at times with a subdecurrent tooth, at first sordid yellowish, soon purplish-brown, fuscous-black or fuliginous, with whitish subfloccose edges.

Stipe $25-51 \times 1.5-5$ mm, equal or slightly thickened toward the base, stuffed to hollow, ochraceous or deep yellow with paler or pallid apex, somewhat appressed squamulose or glabrescent to quite naked, not glutinous. Base with a pseudorhiza immersed in the sand, which is covered by a white floccose mycelium.

Veil well formed, composed of white arachnoid fibrils, mainly in young stages; sometimes as subfloccose evanescent scales on the stipe, and on the pileus margin but not annulus is formed.

Context white or whitish, in part tending to become yellowish in age. Inodorous. Taste not checked.

Spores $(11-) 12-16.5 (-18.7) \times (7.2-) 8.2-9.3 (-10.4) \mu\text{m}$, ellipsoid or subellipsoid, both in face and side view, or somewhat inequilateral in side view, yellowish brown, thick walled, with a broad truncate germ pore.

Basidia $15-25 \times 8-10 \mu\text{m}$, 4-spored, few 2- or 3-spored, hyaline, ventricose.

Pleurocystidia absent.

Cheilocystidia $19-42 \times 3-10 \mu\text{m}$, abundant, hyaline, thin walled, narrowly ampullaceous, but also filamentous, rarely sublageniform and clavate; neck somewhat capitate, $3-4.5 \mu\text{m}$ broad.

Subhymenium seemingly subcellular with short elements, hyaline to brownish.

Trama more or less parallel, hyaline, thin to thick walled. Epicutis formed by a slightly gelatinized thin layer, with parallel elongated hyphae, incrustated with yellowish brown pigment. Hypodermium hyaline but incrustated, with yellowish brown pigment, subcellular, with hyphae up to 15 μm diam. Sometimes vermicular yellow hyphae 4-7 μm diam. are present in the hypodermium. Clamp connections present.

HABITAT AND DISTRIBUTION. Gregarious or solitary, sometimes in small groups or scattered individuals, in sand dunes or sandy soil in pastures (or in alpine areas). Known only from the U.S.A. (Kansas) and Argentina. Fruiting in March to October.

STUDIED MATERIAL. U.S.A., Kansas, Rooks County, *Bartholomew* 2246 (NYS Type; Isotype in TENN 29809); *Bartholomew* 2995 (NYS, in *Ellis & Everhart's fungi columbiani* by E. Bartholomew, No. 1756) (the first collected in August and the second in October).

ARGENTINA, Buenos Aires, Monte Hermoso, *Spegazzini* s.n. (Aug. 8, 1887) (LPS part). Punta Alta, *Spegazzini* s.n. (May 15, 1888) (LPS a new Type of *Stropharia dunicola* proposed) (see below). Prov. Tucuman, Infiernillo, *Singer* T-2254 (LIL Type of *P. squarrosipes*); *Singer* T-2259 (LIL as *P. squarrosipes*).

DISCUSSION. The synonymy with *Stropharia dunicola* Speg. (= *Psilocybe dunicola* (Speg.) Sing.) is here proposed based on the study of Peck's and Spegazzini's materials. Singer (1968) proposed the type of *Stropharia dunicola* Speg., the material collected by Spegazzini on Aug. 8, 1887 ("We have selected as lectotype the specimen better preserved and collected earlier. Both of Spegazzini's collections were first determined by him as *Psilocybe* which were later changed and published as *Stropharia*", wrote Singer, 1968). But the Spegazzini's collection of Aug. 8, 1887 is a mixture of two fungi, one is in fact *Stropharia dunicola*, but the other belongs to *Psathyrella ammophila* (Dur. & Lév.) Orton (!). I have selected as Holotype the Spegazzini's collection from May 15, 1888 at LPS.

It is interesting to see the geographical disjunction in the distribution of this fungus, similar to that of *P. paupera* Sing. (see that, Sect. *Subaeruginosae*). *P. sabulosa* is similar to a *Pholiota* sp. in its the veil, and it is similar also to a *Agrocybe* sp. or a *Naematoloma* sp. in the color and form of its pileus, but the microscopic structure of the pileus, as well as the absence of chrysocystidia, readily separate Peck's species. Singer (1975) considered both *P. squarrosipes* and *P. dunicola* as member of the Section *Merdariae*, but it is better to place them in Section *Atrobrunneae* because of their ellipsoid non-subhexagonal spores. Murrill (1923) shortly discussed Peck's species.

The synonymy with *P. squarrosipes* Sing. is here established, based on the study of the type at LIL. All the taxonomic features of value are the same. Singer (1959) reported spores $12-12.7 \times 7.5-8 \mu\text{m}$, but the study of the spores of the type show them to be $(10-) 12-14.3 (-17.5) \times 7.7-9 \times 6.6-7.7 \mu\text{m}$. One collection of Wright (Dec. 7, 1958) from Achala, prov. Cordoba, Argentina (at BAFC as *P. squarrosipes*), is really *Pholiota* sp. with typical chrysocystidia and spores $(6.7-) 7.5-8.5 (-9.7) \times 4.5-5.5 (-6) \mu\text{m}$.

The name of the species refers to its sandy habitat, as does Spegazzini's name. Singer's name refers to the squarrosoid pileus.

118. *Psilocybe subcoprophila* (Britz.) Sacc. *Syll. Fung.* 11: 72. 1895.

Figs. 402-403 & 406

Agaricus subcoprophylus Britz., *Hym. Südbayern* 8: 9, 1891.

Geophyla coprophila var. *subcoprophila* (Britz.) Kühn. & Romagn., *Fl. Anal. Cham. Sup.*, p. 338, 1953.

Deconica australis Horak, *Darwiniana* 14: 363, 1967.

Pileus (4-) 10-20 (-30) mm in diam., semiglobose to convex to somewhat subumbonate or slightly umbonate, becoming nearly plane in old carpophores, viscid, glabrous with whitish appendiculate remains of veil on the margin when young, even transparently striate at the margin when moist, hygrophanous, reddish brown to dark ochraceous brown, fading to ochraceous, yellowish beige or clay color.

Lamellae broadly adnate, greyish umber or brownish to dark brown-violet, somewhat mottled to almost black, edges whitish and somewhat floccose.

Stipe (10-) 20-40 (-50) $\times$ (1-) 2-3 (-4) mm, equal and elongate, sometimes tapering downward, hollow or stuffed, surface whitish to brownish, silky to floccose-fibrillose or subquarrellose, principally at the apex, with white mycelial felt at the base.

Veil rudimentary, as white fibrils, not forming annulus, but some appendiculations on the pileus margin are present at first.

Context thin and pliant, paler than surface in the pileus; reddish brown and somewhat fibrous in the stipe. Unchanging in color when bruised or drying. Taste and odor none or slightly musty or fungoid.

Spore print purpuraceous black or dark violaceous brown.

Spores (13-) 14-18 (-19) (-22!) $\times$ (6.5-) 7.7-8.8 (-9.9) $\times$ 7.7-9.5 μm , subellipsoid or ellipsoid (not lentiform or subhexagonal) both in face and side view, thick wall (0.5-1 μm) ochraceous brown or dark yellow brown, with a broadly truncate germ pore, up to 1.5 μm wide.

Basidia 33-38 $\times$ 12-14 μm , 4-spored, rarely 2-spored, sterigmata 4-4.5 μm long, hyaline, subclavate or clavate, with a median or more superior constriction.

Pleurocystidia absent or very rarely only near the edges, like the cheilocystidia.

Cheilocystidia 33-40 (-50) $\times$ 8.8-10 (-12) μm , obclavate, fusoid-ventricose or sublageniform, with a subcylindric long and flexuosus neck, 13-22 $\times$ 2-3 (-4) μm , hyaline, abundant, forming a sterile band.

Subhymenium subcellular, with brownish to orangish-brown pigment irregular incrustated on the walls. Trama parallel, hyaline, with thin elongated hyphae, somewhat incrustated. Epicutis with hyaline and gelatinous thin layer of elongated hyphae,

1-3 μm wide, with brown incrustations on the walls. Hypodermium subhyaline or yellowish with globose yellowish-brown colored hyphae, somewhat incrustated on the walls. Clamp connections present.

HABITAT AND DISTRIBUTION. Gregarious or scattered on dung (cows, horses or rarely sheep), in cold weather regions. Known from southern South America, northern and Central Europe and Greenland. Fruiting June-September in Europe and Greenland, and in January-April in Southern South America. Lange (1955) mentioned that Christianen reported this fungus from Iceland and Möller from Faeröes. In "Lapland I have found the species up to about 1300 m alt", wrote Lange (*op. cit.*) He thought that in Greenland it may very well be common around sheep farms, and also occur on dung of native mammals.

STUDIED MATERIAL. GREENLAND, Godthab, Lange 505 (C as *P. coprophila* var. *subcoprophila*).

ARGENTINA, Prov. Tucuman, Tafi del Valle, Monte Negrito, Horak 66/407 & 66/413 (ZT). Tierra del Fuego, Ushuaia, Spegazzini (V-1882) (LPS 16818 Type of *Deconica australis*).

BELGIUM, Femelle, Namur, Thoen 3052 (Herb. Heinemann at LFG).

CZEKOSLOVAKIA, Without locality, Inmobyhirtz (VI-1884) (BRA as *P. coprophila*). Knkin, Fabry (9-1968) (BRA).

GREAT BRITAIN, Yorks, Malham, Watling 340-C (E as *P. coprophila*). Surrey, Oxsnott, Orton 12 (E as *Deconica coprophila*). Somerset, Bossington, Orton 1164 (E as *D. coprophila*). Devon, Brauton, Orton 3771 (E as *P. merdicola*). Inverness, Tomich, Orton 3774 (E).

FINLAND, Kivikylä, Huilu, Saltin s.n. (1-XI-1958) (H as *P. coprophila*). Lammi, Porraskoski, Schulmann s.n. (27-6-1952) (H as *P. coprophila*). Nylandia, Tammi-saari, Schulmann s.n. (25-5-1961) (H as *P. coprophila* var. *subcoprophila*).

FRANCE, Montpellier, Lagarde (Jun. 1900) (PC as *P. bullacea*). Melodum, Rous-sell s.n. (May 1, 1850) (PC as *P. bullacea*).

NORWAY, Wosen, England s.n. (1-II-1914) (O as *P. coprophila*). Troms, Ulls-fjord, Breivikeidet, Stordal s.n. (29-8-1954) (O as *P. coprophila*).

SWEDEN, Vastergotland, Southern Tibro, Kyrkefalla, Lundquist 2366-C (UPS). Goteborg, Slottss-Kogen, Anderson (27-7-1958) (GB). Upland, Estuna, South-western Norr Malma, Lundell s.n. (Sept. 20, 1955) (UPS). Lena, Arby s.n. (Aug. 21, 1941) (UPS as *P. bullacea*).

SWITZERLAND, Davos region, Guzmán 9635 (ENCB).

DISCUSSION. *P. subcoprophila* is macroscopically similar to *P. coprophila* (Bull. ex Fr.) Kumm. and *P. argentina* (Speg.) Sing., but differs in the spore form (subhexagonal in those species). The fungi reported by Eliade (1961) and Bataille (1948) as *Deconica coprophila* and *Psilocybe coprophila*, respectively, maybe belong to *P. subcoprophila* or *P. argentina* because of the size of the spores described by them.

The synonym with *Deconica australis* Horak is based on the study of the type, following Singer (1969). *Stropharia coprophila* (Bull. ex Fr.) Lange sensu Möller is *P. subcoprophila* following Orton (1969).

P. subcoprophila is also close to *P. angustispora* Smith, a species known only from Northwest U.S.A., with large cheilocystidia. *P. subcoprophila* seems more or less common in the North and Central part of Europe. Reports from this species from Europe, besides Britzelmayer's in 1891 (from souther Bavaria, the type locality) are Kühner & Romagnesi (1953), Schulmann (1963), Orton (1969), and Høiland (1978). The report of Lange (1955) from Greenland as *P. coprophila* var. *subcoprophila* agrees well with *P. subcoprophila*. Singer (1969) reported this species from Chile.

Section Squamosae Orton, Not. Roy. Bot. Gard. 29: 80, 1969, emend. Guzmán

Species with ellipsoid and thick walled (1 μ m thick) larger (more than 11 μ m) spores. Pleurocystidia absent. Annulus present. Typical species: *P. squamosa* (Pers. ex Fr.) Orton.

This Section is the same that Singer (1948) considered as *Stropholoma* Sing. in the genus *Naematoloma*, with *Agaricus squamosus* Pers. as the type, as Guzmán (1980) discussed.

Species considered: 119. *P. luteonitens* (Vahl ex Fr.) Parker-Rhodes, 120. *P. percevalii* (B. & Br.) Orton, 121. *P. squamosa* (Pers. ex Fr.) Orton var. *squamosa*, and 122. *P. squamosa* var. *thrausta* (Schulz. ex Kalchbr.) Guzmán.

Key to species

- 1a. Spores (14.3-) 16-19 (-22) μ m long. 119. *P. luteonitens*
- 1b. Spores not more than 16 μ m long. 2
- 2a. Cheilocystidia 33-44 μ m long. 120. *P. percevalii*
- 2b. Cheilocystidia more than 44 μ m long. 3
- 3a. Pileus yellowish brown. 121. *P. squamosa* var. *squamosa*
- 3b. Pileus reddish brown-orange. 122. *P. squamosa* var. *thrausta*

- 119. ***Psilocybe luteonites*** (Vahl ex Fr.) Parker-Rhodes *Trans. Brit. Myc. Soc.* 34: 364, 1951.

Agaricus luteonitens Vahl, *Flora Danica* 18, tab. 1057, 1792.

A. nitens Vahl ex Fr., *Syst. Myc.* 1, p. 284, 1821 (no *A. nitens* Batsch ex Fr., *Idem*, p. 116, 1821).

A. luteonitens Vahl ex Fr., *Epicr.*, p. 220, 1836.

Geophila luteonitens (Vahl ex Fr.) Quél., *Champ. Jura et Vosg.* 1, p. 142, 1872.

Agaricus umbonatescens Peck, *Ann. Rep. N. Y. St. Mus.* 30: 41, 1878.

Stropharia luteonitens (Vahl ex Fr.) Sacc., *Syll. Fung.* 5: 1019, 1887.

S. umbonatescens (Peck) Sacc., *Syll. Fung.* 5: 1021, 1887 (as *umbonescens*).

Geophila umbonatescens (Peck) Kühn. & Romag., *Fl. anal. champ. sup.*, p. 336, 1953.

Figs. 549-551

Pileus 10-25 (-40) mm in diam., subconic or campanulate to convex with a papilla or umbo, viscid, with a very thick separable viscid pellicle, glabrous and even, but somewhat striate at the margin, hygrophanous, pale ochraceous brown or grayish on margin, fading to pale yellowish orange.

Lamellae broadly adnate to adnate-decurrent, at first whitish then gray, finally violaceous brown to blackish brown, with somewhat whitish subfloccose edges or concolorous.

Stipe 35-70 (-100) $\times$ 1.5-3 (-4) mm, equal or subbulbous, dry, stuffed to hollow, toothish, whitish to ochraceous or concolorous with pileus, smooth but covered at first by sparse remnants of the veil. Sometimes with a more or less developed pseudorhiza.

Veil well developed, forming a white membranous and permanent annulus.

Context thin and pallid. Odor often strongly radish or foetid.

Spores (14.3-) 16-19 (-22) $\times$ (8.8-) 10-12 (-13) $\times$ 9.9-11 μ m, subellipsoid or ellipsoid, thick walled, dark yellowish brown, with a broad germ pore.

Basidia 20-30 $\times$ 8-14 μ m, 4-spored, or 1-2-spored, hyaline, subcylindric.

Pleurocystidia absent.

Cheilocystidia 25-45 $\times$ 3-7 μ m, abundant, forming a sterile band, hyaline, thin walled, cylindrical, sublageniform or submoniliform with flexuous neck.

Subhymenium seemingly subcellular, with short elements, with yellowish pigment, somewhat incrusting on the walls. Lactiferous yellow hyphae common 3.3-5.5 μ m diam. Trama parallel, hyaline or yellowish. Epicutis formed by a gelatinized layer with yellowish and parallel narrow hyphae. Hypodermium with hyaline hyphae, somewhat incrusting, not seemingly cellular. Clamp connections present.

HABITAT AND DISTRIBUTION. Gregarious or rarely solitary, on rich soil, dung or about manure heaps in pastures. Parker-Rhodes (1951) reported this fungus in a tussock of *Festuca* sp. Species widespread throughout the Northern temperate zones. Known from U.S.A., Europe and Asia. Fruiting during the summer.

STUDIED MATERIAL. U.S.A., Oregon, Lake Oswego, *Morgan* s.n. (Sept. 20, 1977) (ENCB). New York, Schnevus, *Peck* s.n. (NYS Type of *Agaricus umbonatescens*). Michigan, Ann Arbor, *Kauffman* s.n. (MICH).

ITALY, Mendola, *Bresadola* s.n. (16-VIII-1903) (NY).

DISCUSSION. *P. luteonites* has been interpreted in different ways. Fries (1821) first considered this fungus as *Agaricus nitens* Vahl ex Fr. in the tribe *Psalliotae*, and later (1836) as *A. luteonitens* Vahl ex Fr. in the same tribe *Psalliotae*. Later Peck (1878) described this fungus as *Agaricus umbonatescens* Peck, a merely synonym of *P. luteonitens*. Saccardo (1887) considered Peck's species as a *Stropharia*, and Kühner & Romagnesi (1953) considered it as *Geophila* and Vahl's species as a synonym of Peck's species.

Singer (1975) considered *P. luteonitens* as *Stropharia luteonitens* (Fr.) Quél. in the Section *Stercophila*. Singer wrote "chrysocystidia not always present" "spores enormously large". But one collection of Singer from U.S.S.R. identified by him as *Stropharia luteonitens* (at MICH) agrees well with *P. merdaria* (Fr.) Ricken for the smaller, subhexagonal spores (see Sect. *Merdariae*). Bresadola was some confused with the concept of *P. luteonitens*, because he identified as *Stropharia luteonitens* (Vahl ex Fr.) Quél. a collection from Rick Herbarium probably collected in Brazil (*Bresadola* No. 287 at NY) which agrees well with *P. caeruleoannulata* Sing. ex

Guzmán (see Section *Stuntziae*). However, other specimens in the Bresadola Herb. collected in Italy (in NY), does fit the species concept of *P. luteonitens*. Parker-Rhodes (1951) considered Vahl's species in *Psilocybe*, closely allied to *P. merdaria*. He stated that the subgenus *Stercophila* in *Stropharia*, to which "*P. semiglobata* also belongs" is more naturally placed in *Psilocybe* than in *Stropharia*, since the boundary between this group and *Deconica* is very vague. Parker-Rhodes described *P. luteonitens* with spores $13 \times 8 \mu\text{m}$ with no "germinal papilla".

P. luteonitens have been reported from Europe, besides Parker-Rhodes's report (1951), by Massee (1892), Ricken (1915), Rea (1922), Lange (1923), Konrad & Maublanc (1924), Möller (1945), Kühner & Romagnesi (1953), Favre (1955; 1960), Babos (1968) and Dennis *et al.* (1974) (all as *Stropharia*), in addition to the Vahl's, Fries', Quélet's and Saccardo's works previously cited in the synonymy. Reports of *P. luteonitens* from North America, besides Peck's report on *A. umbonatescens*, are: Kauffman (1918), Murrill (1922) and Stamets (1978). Cleland & Cheel (1918) and Cleland (1934) reported *S. umbonatescens* from Australia. From Japan it is the report of Ito (1959) of *S. luteonitens*.

Stropharia subumbonatescens Murr., described from Florida (Murrill, 1941), is a synonym of *Naematoloma ericaceus* (Pers. ex Fr.) Smith, following Smith (1951) and confirmed by the author in the study of the type (Murrill F-10095, at FLS). Another collection belonging to Murrill's species (Earle 4, collected in Alabama in 1899, and at NY with the number 2752) was identified by Singer as "*Psilocybe subumbonatescens*".

The name of the species refers to the shining yellow pileus (*luteus*, yellow: *nitens*, shining).

SELECTED ILLUSTRATIONS. Kauffman (1918, pl. LI); Stamets (1978, fig. 30) (both as *Stropharia* and *Psilocybe umbonatescens*, respectively). Laplanche (1894) cited the figures: Cooke (t. 604) and Fl. Dan. (t. 1057).

120. ***Psilocybe percevalii*** (Berk. & Br.) Orton *Not. Roy. Bot. Gard.* **29**: 80, 1969. Figs. 552-554

Agaricus (*Stropharia*) *percevalii* Berk. & Br., *Ann. & Mag. Nat. Hist.*, p. 206, 1879.
Stropharia percevalii (Berk. & Br.) Sacc., *Syll. Fung.* 5: 1016, 1887.
S. magnivelaris Peck apud Harriman, *Alaska Exped. Crypt.*, p. 44, 1904.

Pileus (15-) 30-50 (-60) mm in diam., convex to umbonate, or subumbonate or campanulate to plane, slightly viscid, glabrous or subfloccose, with fugacious white veil scales especially towards the margin, pale ochraceous to brownish orange, darker at the umbo.

Lamellae broadly adnate and usually toothed, ivory whitish at first, then cinereous to violaceous brown, concolorous or somewhat whitish and fimbriate at the edges.

Stipe 50-75 (-85) $\times$ 4-6 mm, equal or enlarged above, somewhat rooting, hollow, squarrose to more or less smooth above, whitish to ochraceous.

Veil well developed at first, forming a white membranous to merely fibrillose more or less permanent or evanescent annulus, fairly thick, substrate above.

Context dull umber, somewhat pliant. Odor and taste not checked.

Spores (11.5-) 13-15 (-16) $\times$ 6.5-8 μm , subellipsoid or ellipsoid, thick walled, dark yellowish brown, with a broad germ pore.

Basidia 28-44 $\times$ 9.9-12 μm , 4-spored, hyaline, ventricose.

Pleurocystidia absent.

Cheilocystidia 33-44 $\times$ 4-5 μm , abundant, hyaline, sublageniform or narrowly clavate, or more frequently moniliform, with long and flexuous neck 3-4 μm in diam.

Subhymenium seemingly subcellular with short hyaline elements, with some brownish pigment not so strongly incrustated. Trama parallel and hyaline. Lactiferous yellow cinnamon hyphae present, 5.5-8 μm in diam. Epicutis forming by a hyaline subgelatinous thin layer of elongated hyphae, somewhat incrustated. Hypodermium with elongated to globose hyaline hyphae, 10-25 μm wide. Clamp connections present.

HABITAT AND DISTRIBUTION. Solitary, or scattered to gregarious on the ground, or sawdust, or sandy soil, or on rotten wood, in *Salix* or *Alnus* scrubs, or in grassed. It is common along rivers flats. Fruiting between May or September to October or November, most frequent from June to August. Known only from North of Europe, Northwest of U.S.A., and Alaska.

STUDIED MATERIAL. ENGLAND, Derby, *Watling 11485* (E). U.S.A., Washington, Olympic Mountains, along the Hoh River, *Smith 14138* (MICH as *Stropharia magnivelaris*).

DISCUSSION. A species close to *P. squamosa* (Pers. ex Fr.) Orton but differs in the smaller cheilocystidia (more than 44 μm long in that species). Berkeley & Broome in 1879 in *Ann. & Mag. Nat. Hist.* (see Berkeley & Broome, 1837-1888) described this species from Wallington, Northumberland, England, based it on a collection made by Perceval on sawdust. Rea (1922) reported *P. percevalii* (as a *Stropharia*), also from England, as an uncommon fungus. One collection at E (*Watling 9839*), identified as *Stropharia percevalii*, really is a *Stropharia* sp. with conspicuous and typical chrysocystidia. *Stropharia magnivelaris* Peck described from Alaska (Morgan, 1908; Saccardo, 1905) is here considered synonymous with *P. percevalii* following Dennis *et al.* (1974). Plowright (1896) considered *Stropharia percevalii* as only a form of *S. depilata* Pers., the former with a hollow stem and the latter with a solid one. *P. percevalii* reported by Høiland (1978) from Norway maybe is *P. luteonitens* (Vahl ex Fr.) Parker-Rhodes for the larger spores (he reported (12-) 13-17 (-19) μm long; chemical analyses to this fungus according to Høiland (1978) showed no psilocybin. Smith (1941a) reported several collections of *P. percevalii* (as *Stropharia magnivelaris*) from the Northwest of U.S.A., with spores 11-14 (-15) $\times$ 6-8 μm and cheilocystidia 30-40 $\times$ 4-5 μm .

The name of the species is in honor of Cecil H. Spencer Perceval who collected the type during the last Century in Great Britain.

SELECTED ILLUSTRATIONS. Smith (1941a, pl. XXIV, as *Stropharia magnivelaris* Pk.). Laplanche (1894) as *Stropharia percevalii* cited the figures: Cooke (t. 550 & 555 (var.), and Grevillea, VII, t. 126, f. 1.

121. ***Psilocybe squamosa*** (Pers. ex Fr.) Orton *Not. Roy. Bot. Gard.* **29**: 80, 1969
var. ***squamosa*** Figs. 555-556 & 681

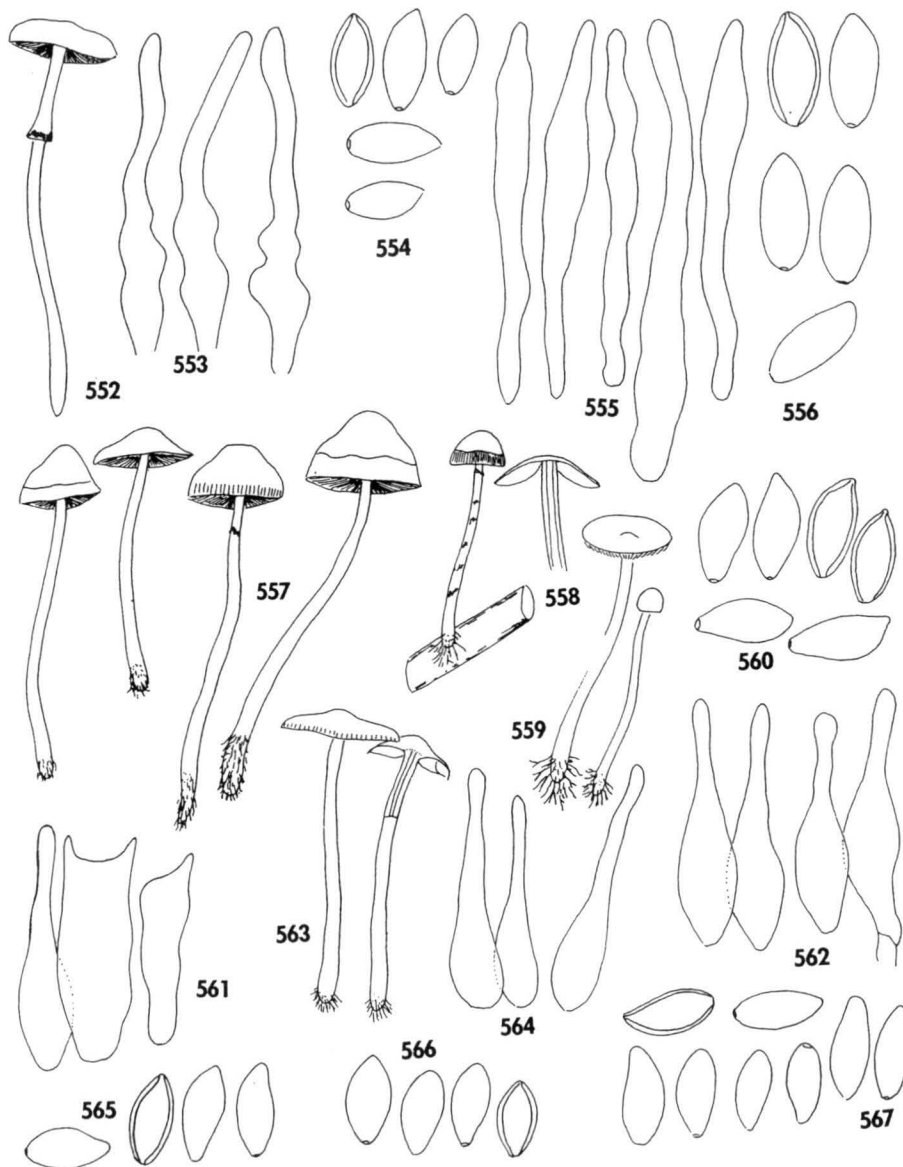
Agaricus squamosus Pers., *Synop. Meth. Fung.*, p. 409, 1801.
A. squamosus Pers. ex Fr., *Syst. Myc. 1*, p. 284, 1821.
Geophila squamosa (Pers. ex Fr.) Quél., *Enchir. Fung.*, p. 111, 1886.
Stropharia squamosa (Pers. ex Fr.) Sacc. *Syll. Fung.* 5: 1015, 1887.
Psalliota squamosa Schroeter, *Krypt. Fl. Schles. 1*: 574, 1889.
Stropharia distans (Pers.) Morgan, *Jour. Myc.* 14: 75, 1908.
Naematoloma squamosum (Pers. ex Fr.) Sing., *Lilloa* 22: 503, 1949.

Pileus (20-) 30-50 (-80) mm in diam., hemispherical to conic or convex, not umbonate, then flattened, more infrequently subumbonate, viscid, with a separable pellicle when fresh, subsquamose, sprinklet with superficial and conspicuous, fugacious, pilosofasciculate concentric white scales from the veil, mainly towards the margin, surface glabrous and even, more or less hygrophanous, brownish to ochraceous, but with the disc tawny or somewhat reddish brown.

Lamellae adnate, with a slight decurrent tooth, pallid bluish gray or cinereous when young to blackish violaceous, with the edge white slightly fimbriate.

Stipe (50-) 60-90 (-150) × (3-) 5-6 (-8) mm, equal or somewhat thickened at the base, tough, hollow to stuffed, whitish, becoming ferruginous or pale red brown, with fibrillose white recurved scales, or covered over with dense, strigose fibrils below the ring.

Plate 37: Figs. 552-568. - Several species of *Psilocybe*. 552-554: *P. percevalii*, 552: Carpophore, 553: Cheilocystidia, 554: Spores (from Watling 11485). 555-556: *P. squamosa* var. *squamosa*, 555: Cheilocystidia, 556: Spores (from Smith 52919). 557-562: *P. aztecum* var. *aztecum*, 557-559: Carpophores, 560: Spores; Hymenium with one pleurocystidia and two basidia, 562: Cheilocystidia (557: Guzmán 16551; 558: Guzmán 16485; 559: Guzmán 16493; 560-562: type). 563-565: *P. aztecum* var. *bonetii*, 563: Carpophores, 564: Cheilocystidia, 565: Spores (all from the type). 566: *P. quebecensis*, Spores (type). 567: *P. baecystis*, Spores (type).



Veil as a membrane well formed, white. Annulus whitish, membranous to subfibrillose, thin, permanent, striate on the upper surface, with brownish fibrillose patches underneath, the above surface usually concolorous with the gills because of spores.

Context pallid to brownish often reddish when moist, thin, usually darker in the stipe than on the pileus, watery. Odor faintly pungent, taste mild. Dry specimens have a pleasing odor, like bread.

Spores (11-) 12-14 (-16.5) $\times$ 6.6-7.7 (-8.5) μm , subellipsoid, thick walled (1-1.5 μm) dark yellowish brown, with a broad germ pore.

Basidia 24-35 $\times$ 7.7-11 (-15) μm , 4-spored, hyaline, subpyriform or ventricose, sterigmata conic, up to 5.5 μm long.

Pleurocystidia absent.

Cheilocystidia (36-) 44-66 $\times$ 3.3-6 μm , abundant, hyaline, filamentous or sublageniform, submucronate, or with long and flexuous neck, 3-4 μm in diam. Apices acute with a hyaline gelatinous globose mass.

Subhymenium with hyaline elements, seemingly subcellular. Trama more or less parallel, hyaline or brownish, composed of interwoven no incrustated hyphae. Epicutis as a gelatinized thin layer of subhyaline subparallel hyphae. Hypodermium hyaline to brownish, with cellular elements up to 10 μm diam., somewhat incrustated. Lactiferous hyphae present in the subhymenium and hyphodermium, yellowish, 4-5 μm broad. Clamp connections present.

HABITAT AND DISTRIBUTION. Gregarious of in small groups on rich soil or on humus in coniferous and deciduous (*Fagus* and *Quercus*) forest, or on heaths, rarely on rich soil in meadows. Fruiting in summer to till late autumn, rarely in early winter. Known from the U.S.A. and Europe.

STUDIED MATERIAL. U.S.A., Colorado, Pitkin, Aspen, *Leslie 2589* (ENCB). San Miguel, San Juan Mts., Trout Lake, *Smith 52919* (MICH). Washington, Rainer Nat. Park, Lower Tahoma, *Smith 31687* (MICH).

AUSTRIA, Without locality, *Heimerl* s.n. (9-IX-1905) (W).

SWEDEN, Skane, Bara, Rorup, *Anderson 57* (LD).

DISCUSSION. "Since *S. squamosa* has no chrysocystidia, I would, however, transfer this to *Psilocybe* too, rather than make it an anomalous member of *Hypholoma* as Singer does", wrote Orton (1969). In fact, the absent of chrysocystidia place this fungus in *Psilocybe*, but it is noteworthy that the structure of the hypodermium in *P. squamosa* is subcellular then, similar to that considered by Singer (1975) to be characteristic of *Naematoloma*, but as was discussed by Guzmán (1980), *Psilocybe* has hypodermium either or nor subcellular, but never has chrysocystidia. In addition to Orton's (1969) report, *P. squamosa* var. *squamosa* was reported by Cooke (1881-1891) and Rea (1922) from England. Lange (1939) reported it from Denmark, and Kühner (1928) and Kühner & Romagnesi (1953) reported it from Europe. Smith (1949) and Stamets (1978) reported this fungus from U.S.A. Cooke (1892) reported *Agaricus (Stropharia) squamosus* from Australia. Malençon & Bertault (1970) reported *Geophila squamosa* from northern Africa. Høiland (1978)

reported *Psilocybe squamosa* from Norway. This latter author considered the species with spores (11-) 12-15.7 (-17.2) $\times$ (6-) 6.7-9 $\times$ (6-) 6.7-7.5 (-8.2) μm ; cheilocystidia 28.5-46.5 $\times$ 5-7.5 μm , and hypodermium of subcellular hyphae, 13.5-22.5 μm wide. Petersen (1970) reported *Stropharia squamosa* from fireplaces in Denmark. *Stropharia distans* (Pers.) Morgan is consider synonym of *P. squamosa* following Smith (1949). Morgan (1908) described this fungus from North Carolina and New York, based in a specimen identified as "*Agaricus distans* Pers., *Disp. Meth. Fung.* 1797". *P. squamosa* var. *squamosa* is edible according to Konrad & Maublanc (1924-1937), but it is not mentioned in popular books on edible fungi. Chemical analyses showed no psilocybin, according to Høiland (1978).

The name of the species refers to the subsquamose pileus.

SELECTED ILLUSTRATIONS. Kühner (1928, in Atlas, pl. XXVI); Smith (1949, reel 27, No. 187); Stamets (1978, fig. 25). Laplanche (1894) as *Stropharia squamosa* cited the figures: Berkeley (Outl. t. 10, f.6), Cooke (t. 553), Fl. Dan. (t. 2077, f. 1, 2 (var.)), Gillet (t.399), Lucand (t.190), Patouillard (Tab. 655), and Roze & Rich. (Atl. t. 18, f. 14-17).

122. *Psilocybe squamosa* var. *thrausta* (Schulz. ex Kalchbr.) Guzmán, comb. nov.

Agaricus (Stropharia) thraustus Schulz. ex Kalchbr., *Icon Sel. Hymen. Hung.*, T. 15, f. 2, 1873.

A. squamosus ssp. *thraustus* Fr., *Hymen Eur.*, p. 286, 1874.

Stropharia thrausta (Schulz. ex Kalchbr.) Sacc., *Syll. Fung.* 5: 1016, 1887.

S. squamosa (Fr.) Quél. var. *thrausta* (Kalchbr.) Mass., *Brit. Fung. Fl. I*, p. 402, 1892.

Naematoloma squamosa (Fr.) Sing. var. *thrausta* (Schulz. ex Kalchbr.) Imaz. & Hongo, *Jap. Bot.* 32: 146, 1957.

Psilocybe thrausta (Schulz. ex Kalchbr.) Bon, *Bull. Soc. Myc. Fr.* 85, Atlas pl. 182, 1969.

Geophila squamosa (Pers. Fr.) Kühn. & Romag., *Fl. anal. champ. sup.*, p. 336, 1953.

Pileus 30-50 mm in diam., conical to subumbonate, reddish orange-brown or rather dark dull red-brown, fading to orange-brown to orange-ochraceous-brown with a pinkish salmon tinge at the margin.

Stipe as the type variety, but with small, brown fibrillose squamules when young, becoming more reddish-brown with age.

All the other macroscopic, and all the microscopic features are as in the type variety.

HABITAT AND DISTRIBUTION. The same as the type variety, but also on stumps. Known from the U.S.A., Europe and Japan.

STUDIED MATERIAL. U.S.A., New York, Salamanca, *Peck* s.n. (NYS as *Stropharia squamosa* var. *aurantica*).

FRANCE, Tournhem, *Bon 73101301* (Bon Herb.; ENCB). Aigooal, *Bon 1539* (Bon Herb.; ENCB). Murmal, *Bon 91060* (Bon Herb.; ENCB) (all as *P. thrausta*).

HOLLAND, Niersen, Gelderland, *Bas 4920* (L & ENCB, as *Stropharia squamosa* var. *thrausta*).

DISCUSSION. This variety has been confused with *Naematoloma aurantiaca* (Cooke) Guzmán (= *Agaricus squamosus* f. *aurantiacus* Cooke; *A. (Stropharia) thraustus* f. *aurantiacus* Cooke and *Stropharia squamosa* var. *aurantica* (Cooke) Mass., a fungus with chrysocystidia and a cellular hypodermium (see Guzmán, 1975). Bon (1969), and Moser (1978) considered this variety as an independent species; the former placed it in the genus *Psilocybe* and the latter in *Stropharia*, but as all the macroscopic and microscopic features are the same as the type variety, it is preferable to consider Kalchbrenner's fungus as a variety of *P. squamosa*. The only difference between both fungi is the color, more orangish-red in var. *thrausta*.

P. squamosa var. *thrausta* was reported from England by Berkeley & Broome (1837-1885) and Cooke (1881-1891) (both as *Agaricus (Stropharia) thraustus*), and from U.S.A. as *P. thrausta* (Schulz.) Bon by Bigelow (1978). Malençon & Bertault (1970) reported *Geophila squamosa* var. *thrausta* from northern Africa. Imazequi & Hongo (1957) and Ito (1959) reported it as *Naematoloma squamosa* var. *thrausta* (Schulz. ex Kalchbr.) Imaz. & Hongo from Japan. Recently, Malençon & Llimona (1980) reported *Stropharia thrausta* from Spain, with a good plate. Rick's collection from Brazil, as *Stropharia thrausta* var. *aurantiaca* (Rich 15228, in PACA 9378) is *Naematoloma* sp. for the well defined chrysocystidia, and the lack of an annulus.

The name of this variety refers to the scaly surface of the pileus.

SELECTED ILLUSTRATIONS. Bon (1969, Atlas pl. CLXXXII); Moser (1978, pl. 52 b), Malençon & Llimona (1980, pl. I).

Sect. *Aztecorum* Guzmán, sect. nov.

Pileus magnopere hygrophanus, brunneus vel albus vel cremeus. Pleurocystidia hyalinis. Sporibus asymmetricis. Carne caerulescente. Sublignicola, singularis in America borealis. Type: *Psilocybe aztecorum* Heim emend. Guzmán.

Pileus strongly hygrophanous, brown or brownish drying white to whitish. Bluing species. Pleurocystidia when present hyaline. Spores asymmetric (in mango shape) in side view. Sublignicolous, boreal species known only in North America.

Species considered: 123: *P. aztecorum* Heim emend. Guzmán, var. *aztecorum*, 124. *P. aztecorum* var. *bonetii* (Guzmán) Guzmán, 125. *P. baeocystis* Sing. & Smith emend. Guzmán, and 126. *P. quebecensis* Oláh & Heim.

Key to species

- 1a. Species known only from the high mountains of Central Mexico. 2
- 1b. Species known only from U.S.A. and Canada. 3
- 2a. Spores (10.4-) 12-14 (-17) μ m long. Growing in *Pinus hartwegii* forests at 3200-4000 m elevation. 123. *P. aztecorum* var. *aztecorum*
- 2b. Spores (9-) 10-13 (-14) $\times$ 6-7.5 (-8) μ m long. Growing in *Abies* and *Pinus-Quercus* forests, at 2000-3200 m elevation. 124. *P. aztecorum* var. *bonetii*
- 3a. Pleurocystidia scarce. Known only from NW North America (U.S.A. and Canada). Spores (8.5-) 9.5-13.7 (-17) μ m long. 125. *P. baeocystis*
- 3b. Pleurocystidia common. Known only from NE North America (Quebec, Canada). Spores (7-) 8.8-11 (-13.8) μ m long. 126. *P. quebecensis*

123. ***Psilocybe aztecorum*** Heim emend. Guzmán *Mycologia* 70: 387, 1978 var. ***aztecorum*** Figs. 557-562, 692, 694-696 & 703

P. aztecorum Heim, Rev. Myc. 22: 78, 1957.

P. mexicana var. *longispora* Heim, *Compt. R. Acad. Sc.* 242: 1393, 1956.

Pileus (5-) 15-20 (-35) mm in diam., obtuse or convex to campanulate or subumbonate, becoming expanded, eventually umbilicate and in some old specimens opening into to the hollow stipe, lubricous, glabrous, even but translucent striate along the margin when moist, strongly hygrophanous, yellowish brown or yellow-gold in young button forms, brown gray in the age, with greenish gray tint on the margin, soon changing regularly or sometimes irregularly to whitish to milk white from the disc to the margin, finally remaining completely white, but when dried whitish straw to pale brownish, not strongly bluing, only the margin stains slightly green-blue.

Lamellae adnate or adnexed, light violet gray to dark violet brown or chocolate violet, uniform in color or with whitish and subfloccose edges.

Stipe (25-) 55-75 (-95) $\times$ (1.5-) 3-4 (-5) mm, equal or thicker at the apex, cylindric or sometimes plane, straight or flexuous, smooth, silky-fibrillose, hollow, whitish to greyish, staining blue-green irregularly when touched or in age; with abundant well developed white rhizomorphs at the base.

Veil as white, arachnoid and fugaceous cortina in young stages, that sometimes remains as a non-permanent subannulus on the stipe.

Context whitish to yellowish or reddish yellow in the pileus, or reddish brown in the stipe, not or slight bluing. Odor and taste slightly farinaceous in fresh specimens to strongly farinacelus in dry specimens. KOH stains pileus, stipe and context reddish brown; the stipe sometimes not staining or slightly yellowish red.

Spore print blackish violet.

Spores (10.4-) 12-14 (-17) $\times$ (6-) 6.6-7.7 (-8.8) $\times$ 6-7.5 μ m, elongate-ellipsoid in face view, almost terete, slightly inequilateral or asymmetrical (in mango form) in side view; thick walled, dark yellowish brown, with a broad germ pore; some spores are very irregular in form, strongly elongated 22-23 μ m long.

Basidia 24-33 $\times$ 6.6-8.8 (-10.5) μ m, 1-, 2-, 3- or 4- spored, more commonly 4-spored, hyaline or sometimes somewhat yellowish, clavate or subcylindric, some with a slight median constriction.

Pleurocystidia scattered, similar to the cheilocystidia in form and size, hyaline, some with the neck bifurcate or branched.

Cheilocystidia 20-45 $\times$ 5-8.2 μ m, abundant, forming a sterile band, hyaline, fusoid-ampullaceous, with filamentous neck 6-11 $\times$ 1.6-2.5 μ m.

Subhymenium seemingly subcellular with globose elements interwoven with hyphae, hyaline to yellowish or brownish, without incrusting pigment on the walls of the hyphae. Trama hyaline, regular, formed by elongated hyphae. Epicutis formed by a thin gelatinous layer of hyaline or brownish hyphae 1.5-2.5 μ m diameter. Hypodermium hyaline, with elongated to subglobose hyphae 10-18 μ m diameter. Clamp connections present.

HABITAT AND DISTRIBUTION. Gregarious in groups of 5-20 fruit bodies, sometimes fasciculate, sublignicolous or lignicolous, growing on soil with wood debris or on twigs or very rotten logs, rarely on pines cones, in open woods of *Pinus hartwegii* with abundant grasses such as *Festuca tolucensis* and *Muhlenbergia quadridentata*, and the herbaceous plant *Alchemilla procumbens*, at 3200-4000 m of elevation. This fungus fruits August to October. Known only from the high mountains of Central Mexico, such as Sierra Nevada (Rio Frio, Popocatepetl and Paso de Cortés), Nevado de Toluca and La Malinche, in the States of Mexico, Puebla and Tlaxcala. It is very likely that this species also grow in other high mountains of Mexico, such as those of the States of Nuevo Leon, Veracruz, Colima and Chiapas which have ecological conditions similar to those of the known localities.

STUDIED MATERIAL. MEXICO, State of Mexico, Rio Frio Region, Parque Nacional Llano Grande, *Guzmán 8219* (ENCB). Southeastern San Pedro Nexapa, Cañada de Nexpayantla, *Camacho 50 & 77* (ENCB); *Pollock* s.n. (Oct. 19, 1976) (ENCB). San Pedro Nexapa (material bought from the Indians), *Guzmán 1234-B* (ENCB); *Herrera* (MEXU 851 & 2687); *Marino* s.n. (MEXU 6976). Region of Nevado de Toluca, road to Sultepec, between Raices and Cajones, *Guzmán 16485; 16453; 16500; 16518* (ENCB). Nevado de Toluca, National Park, *Pérez-Ortiz 449* (ENCB); *Mora 173* (ENCB). State of Puebla, southeastern Paso de Cortés, *Heim 192* (PC Type); *Guzmán 1099*, (ENCB; MICH); *Herrera* s.n. (MEXU 4407); *Guzmán 16551; 16553; 16561; 16562* (ENCB); *Jacobs* s.n. (Sept. 5, 1976) (ENCB). State of Tlaxcala, La Malinche, *Guzmán 1300* (ENCB).

DISCUSSION. *Guzmán* (1978b) emended *P. aztecorum* Heim based in the color variation of the pileus, for its strong hygrophanity, the mycenoid form, the rhizoids at the base of the stipe, the sublignicolous and lignicolous habitat and the size of the spores, features not clearly detailed in Heim's descriptions (Heim, 1956b, 1957b, c; Heim & Wasson, 1958) or in Singer & Smith's (1958b). They described a terricolous white fungus, with spores 10.5-14 $\times$ 6-7.2 $\times$ 6-7.5 μ m (Heim, 1957b), 10.5-15 (-16) $\times$ 6.1-6.7 (-7.6) $\times$ 6-8 (-8.3) μ m (Heim & Wasson, 1958), and 10.5-14 (-16.2) $\times$ 5.3-7.7 (-8.8) μ m (Singer & Smith, 1958b).

This fungus is employed among the Mexican Indians of the Popocatepetl region, e.g. in the town San Pedro Nexapa, in sacred religious rites. Little by little this use is being lost. The younger generation of Indians sell this fungus to the "tourists" on the road to Popocatepetl, as is happening in Huautla de Jiménez, with other hallucinogenic fungi. The popular names of *P. aztecorum* are "niños" or "niñitos" (children or little children) or "apipiltzin" in the nahuatl language. Heim & Hofmann (1958a,b) isolated psilocybin from this fungus. This species was cultured by Heim and Cailleux in Paris (see Heim & Wasson, 1958). Some fruit bodies obtained from culture by Singer in 1957 and identified as *P. aztecorum*, belong to *Panaeolus cyanescens* (Berk. & Br.) Sacc., according to the materials deposited in MICH and studied by the author (the labels of the cultures were probably mixed). Fig. 10 in Schultes & Hofmann (1973) listed as *P. aztecorum* (photo. by Wasson) belongs to *P. caeruleus*.

The name of the species refers to the Aztec Indians, who ate this fungus before the Spanish came to America. This fungus together with his var. *bonetii* are very related to the "teonanácatl" reported by Sahagún in the sixteenth century in Mexico City, the oldest city of the Aztec, called Tenochtitlan.

Species closely related to *P. baeocystis* and *P. quebecensis* (see discussion of these).

SELECTED ILLUSTRATIONS. Heim & Wasson (1958, pl. XV, figs. 10-16). *Guzmán* (1978d, p. 111, and 1978b, figs. 14-17 & 20).

124. *Psilocybe aztecorum* var. *bonetii* (*Guzmán*) *Guzmán Mycologia* 70: 392, 1978. Figs. 563-565 & 693

P. bonetii *Guzmán*, *An. Esc. Nac. Cienc. Biol.* 17: 9, 1968.

All the macroscopic features are the same as in the type variety. The only difference seems to be the size of the spores: (9-) 10-13 (-14) $\times$ 6-7.5 (-8) $\times$ 6-7 μm , as well as the ecological distribution, as Guzmán (1978b) discussed.

HABITAT AND DISTRIBUTION. This fungus grows in the same substrata as the type variety, mainly on humus, but only in *Pinus montezumae* and *Abies religiosa* forests, between 2000-3300 m of elevation. Unknown from the *Pinus hartwegii* forests. Known only from Mexico (States of Mexico and Morelos, and Distrito Federal). It fruits between August to November, rarely in July.

STUDIED MATERIAL. MEXICO, Distrito Federal, Desierto de los Leones, near El Convento, *Rodríguez Vargas* s.n. (Aug. 11, 1968) (ENCB); La Venta, trail to El Convento, *Guzmán 12002* (ENCB). State of Mexico, 5 km western Rio Frio, near Puerto del Aire, near road Puebla-México, *Arcos Mata 76* (Type, ENCB); *Rios Padilla 34* (ENCB); Municipio de Ixtapaluca, near Zoquiapan, Cañada de Temascatitla, *Calderón* s.n. (Sept. 16, 1980) (ENCB). San Pedro Nexapa town (material brought from the Indians), *Guzmán 7483* (ENCB; NY). Southeastern San Pedro, Nexapa, Cañada de Nexpayantla, *López Gonzáles 301* (ENCB); Region of Nevado de Toluca, west of Tenango del Valle, Barranca del Diablo, *Guzmán 1742 & 1746-B* (ENCB). State of Morelos, Region N of Tepoztlán, near El Parque Station, San Juan Tlacotenco, *Montiel Arcos* s.n. (Nov. 18, 1977) (Univ. Morelos Herb. & ENCB).

DISCUSSION. Ecologically *P. aztecorum* var. *aztecorum* and *P. aztecorum* var. *bonetii* differ in the altitude of their habitats. The typical variety grows in high mountains, between 3300-4000 m elevation and var. *bonetii* between 2000-3300 m. They have the same relationships between the altitude and spore length as in other fungi (see Guzmán, 1978 b,c). Ott & Guzmán (1976) reported psilocybin, but not psilocin in this variety. The report from the State of Morelos is the first known of this taxon, and it agrees with the ecology of this species; the locality has a *Pinus-Quercus* forest, at 2000 m elevation.

The name of this variety is in honor of Dr. Federico Bonet, emeritus professor of the ENCB (died in 1980), who value helped to the author in his doctoral studies.

125. *Psilocybe baeocystis* Singer & Smith emend. Guzmán *Mycologia* 70: 393, 1978. Figs. 567, 570-573, 641-642, 700, 733, 755-756, 758 & 776

P. baeocystis Singer & Smith, *Mycologia* 50: 141, 1958.

Pileus 10-20 (-54) mm in diam., conic when young to convex or campanulate in age, slightly plane or depressed in old specimens, sometimes slight umbonate, glabrous, even, or slightly verrucose-venose at the top to faintly striate at the margin when moist, but no when very young. Margin incurved at first, markedly undulated or wavy. Surface viscid because of a hyaline gelatinous separable pellicle, strongly hygrophanous, dark chestnut brown, brownish vinaceous red, brownish orange or olive brown, but soon fading to yellowish, whitish, or cream milk color from the top

to the margin, readily staining blue or greenish blue, remaining in some specimens completely dark blue to dark brown olive.

Lamellae adnate to uncinata, rose brown to brownish violaceous or dark cinnamon, sometimes somewhat mottled, with edges concolorous or whitish.

Stipe 30-55 (-70) $\times$ (1-) 2-3 (-4) mm, equal, cylindrical, straight or irregularly flexuous or twisted, stuffed with loose whitish to yellowish fibrils, surface white to yellowish orange-brown when touched, covered irregularly with floccose fibrils, sometimes scabrous-strigose at the base, ascending upwards, but without rhizomorphs, readily staining blue-green when injured.

Veil white and arachnoid or cortinate, copious at first, but leaving fibrillose remnants on the stem, sometimes forming a subannular and very ephemeral zone on the upper part of the stipe.

Context yellowish brown in the pileus, brownish orange in the stipe, staining blue when cut; odor and taste weakly to strong farinaceous. KOH stains pileus and context light to dark reddish brown, but is negative or slightly vinaceous rose on stipe.

Spore print violet brown.

Spores (8.5-) 9.5-13.7 (-17) $\times$ (5-) 5.5-6.6 (-7.1) $\times$ 6.6-7.1 μm , elongate-ellipsoid in face view, asymmetrically ellipsoid or mango shaped in side view, thick-walled (1 μm), dark yellowish brown, with a broad germ pore and a short basal appendage.

Basidia (20-) 22-31 $\times$ 6.3-8 (-9) μm , 1-2-3- or mostly 4-spored, hyaline or sometimes stramineous, clavate or subcylindric or subpyriform.

Pleurocystidia present only near the edge of the gill, sometimes absent or similar to the cheilocystidia.

Cheilocystidia 20-32 (-44) $\times$ 4.4-6 (-9) μm , abundant, forming sterile band, hyaline, fusoid-ampullaceous with a long thin neck 1-2 μm diameter, simple or rarely irregularly bifurcate, sometimes with a hyaline viscid drop at the apex.

Subhymenium hyaline to yellowish, seemingly subcellular, as a layer of small globose to filamentous elements, more or less pigmented or incrustated on the walls. Trama regular, hyaline, formed of elongated parallel thin walled hyphae. Epicutis a very conspicuous and thick hyaline and gelatinous layer of narrow parallel but loosely arranged hyphae. Hypodermium subhyaline to brownish formed of compacted disposed subglobose or parallel hyphae. Clamp connections very common.

HABITAT AND DISTRIBUTION. Scattered to gregarious, rarely caespitose, sublignicolous on mulch with wood chips or bark or decayed sawdust of conifers, under bushes, in gardens or flower beds, more rarely in campus grasses (the specimens from grasses often have the stipe twisted or irregularly flexuous). Unknown in fields, very rare in the forests. The specimen *Smith 24403* is the known only from a wild habitat; this latter was growing on a very rotten wood covered by mosses. Known only from Northwestern North America, from British Columbia to Washington and Oregon. Unknown in California (see discussion).

STUDIED MATERIAL. CANADA, British Columbia, Vancouver, *Guzmán* 16620; 16627; 16628; 16632; 16634 (ENCB); *Pollock* 10-25-76; 10-26-76; 10-27-76 (ENCB); *Haard & Pollock* 76-1; 76-2; 76-3 (ENCB).

U.S.A., Oregon, Siltcoos Station, West Lake, *Guzmán* 16668 (ENCB). Dunes City, *Menser* 4568 (ENCB). New Port, *Menser* 4570 (ENCB). Portland, *Leslie* 3694; 3695 (ENCB); *Rhoades* 209 (ORE); near Portland, Rose Garden, *Guzmán* 16643 (ENCB; NY). Beaverton, *Jacobs XII-76* (ENCB). Lane, Lake Woahink, *Leslie* 3904 (ENCB); *Menser* 866 (ENCB). Benton, *Leslie* 3971 (ENCB). Beaverton, *Leslie* 3995; 3999 (ENCB). Eugene, *Sipe* 754 (11-1-1945) (MICH Type). Mt. Hood, *Smith* 24403 (MICH). Washington Olympia, Capitol Lake, *Ott* 75-4 (ENCB); *Guzmán* 16637 (ENCB); *Leslie* 2731; 3837 (ENCB). Evergreen State College, *Guzmán* 16636 (ENCB). *Bigwood* 06, 11 & 17 (ENCB). Seattle, Campus of the Univ. of Washington at Seattle, *Ott* 75-1 (ENCB). Near Seattle, road to Vancouver, *Guzmán* 16604 (ENCB). Near Tacoma, *Stamets* 78-20 (ENCB).

DISCUSSION. The emendation made by *Guzmán* (1978b) was based on the asymmetric form (mango shape) of the spores not reported by *Singer & Smith* (1958a,b), as well as on their size, and on the color variation of the strongly hygrophanous pileus, brownish orange when fresh to whitish when dry, features also not well shown by *Singer & Smith* (1958a,b). *P. baeocystis* is one of the common hallucinogenic mushrooms in the northwest of North America, and easy recognized by its whitish pileus when dry. Chemical studies in *P. baeocystis* show that this species is hallucinogenic but confused as dangerous. *Buck* (1961) reported this fungus as poisonous because it produced death in a child from Oregon. *Benedict, Brady & Tyler* (1962) reported psilocin but not psilocybin. Later, *Benedict, Brady, Smith & Tyler* (1967) reported a small amount of psilocybin. *Leung et al.* (1965) reported psilocybin and psilocin, but later *Leung & Paul* (1968) isolated baecocystin and nor-baecocystin from *P. baeocystis*, substances analogues to psilocybin.

This species is closely related with the Mexican fungus *P. aztecorum*, both varieties. The main difference seem to be the geographical distribution. Maybe, *P. baeocystis* is a merely synonymous of *P. aztecorum*. It is very close also to *P. quebecensis* *Ola'h & Heim* (see discussion of that).

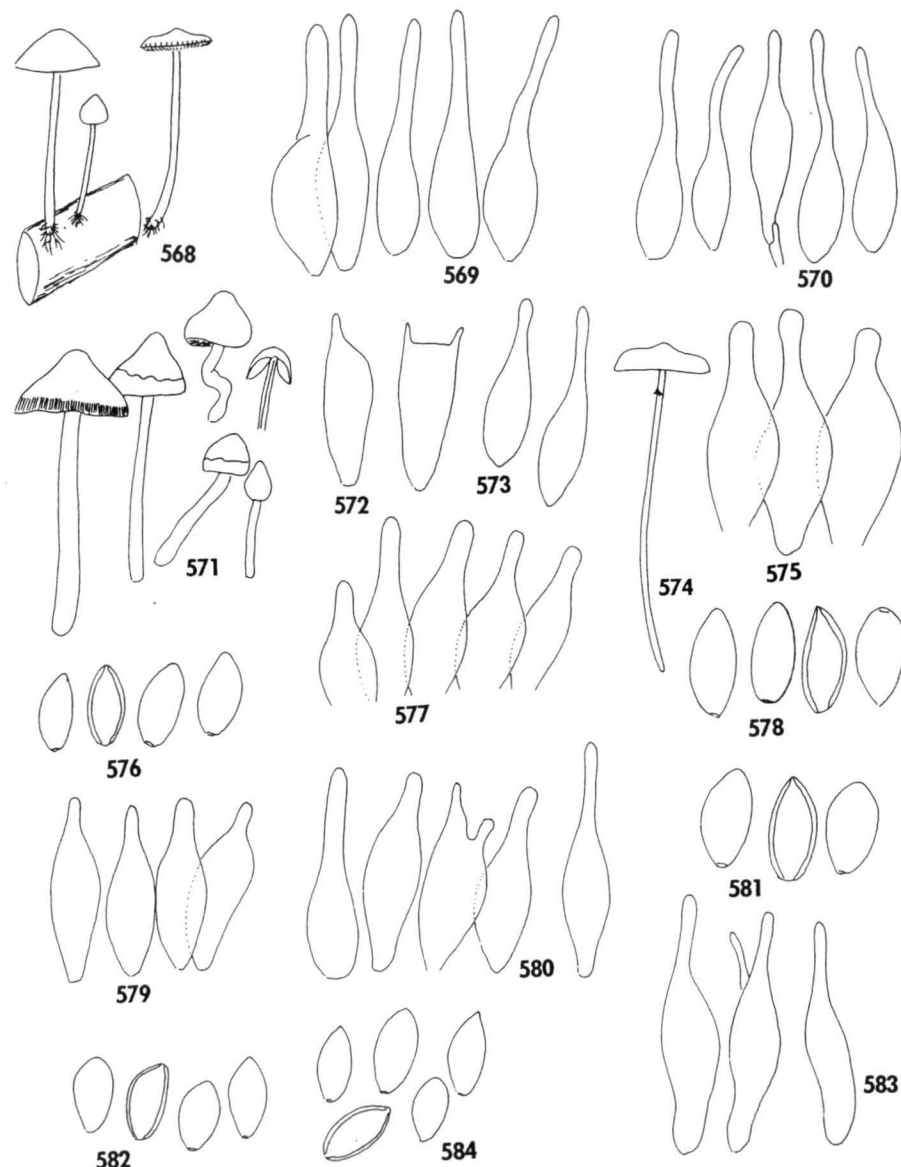


Plate 38: Figs. 568-584. - Several species of *Psilocybe*. 568-569: *P. quebecensis*, 568: *Carpophores*, 569: Cheilocystidia (all from the type). 570-573: *P. baeocystis*, 570: Cheilocystidia, 571: *Carpophores*, 572: Basidia, 573: Pleurocystidia (570 & 572-573: type; 571: *Guzmán* 16655). 574-576: *P. australiana*, 574: *Carpophore*, 575: Pleurocystidia, 576: Spores, 577: Cheilocystidia (all from the type). 578-583: *P. cyanescens*, 578: Spores, 579: Pleurocystidia, 580: Cheilocystidia, 581-582: Spores, 583: Cheilocystidia (578-580: *Henderson* 1213; 581 & 583: *Tjallingii*; 582: *Ower*). 584: *P. eucalypta*, Spores (type).

This species was somewhat confused with *P. strictipes* Sing. & Smith (= *P. callosa* (Fr. ex Fr.) Quél.) by Singer & Smith (1958b). Some collections reported by them as *P. strictipes* belong to *P. baeocystis*, as in the case of specimen Smith 24403 (MICH) (Fig. 700), mistakenly identified as *P. strictipes*. On the other hand, Fig. 50 of Singer & Smith (1958b), identified as *P. strictipes* was taken from the photograph Smith 24403 (Fig. 700). The illustration 13-5 of Moore-Landecker (1972) (mistakenly shown as "*Psilocybe strichper*") is also the same Smith's photograph 24403. Singer & Smith (1958b) differentiates in the key *P. baeocystis* from *P. strictipes* only on the size of the cheilocystidia, shorter in *P. baeocystis*.

The hallucinogenic fungus reported by Heim *et al.* (1966) from Canada and seized by the Royal Canadian Mounted Police in Vancouver, surely belongs to *P. baeocystis*, for its spores (11.6-13.3 (-16.6) (-18) $\times$ 6.8-7.6 (-10.8) μ m reported. Heim who made the mycological study of that material, noted that it is related to *P. aztecorum*. *P. baeocystis* was mistakenly recorded from California by Guzmán *et al.* (1976), based on the collection Thiers 24723 (SFC) which is really *P. cyanescens* Wakef. It is probable that the record of Vergeer (1977) from California belongs also to *P. cyanescens*.

The name of the species refers to the comparatively smaller cheilocystidia (from the Greek, *baio*, small), i.e., small, in comparison with other species described by Singer & Smith (1958 a,b).

SELECTED ILLUSTRATIONS. Ott & Bigwood (1978, fig. 5), Stamets (1978, figs. 11-12), Menser (1977, fig. 17).

126. *Psilocybe quebecensis* Ola'h & Heim *Nat. Canad.* **94**: 574, 1967.

Figs. 566, 568-569

Pileus 10-30 (-35) mm in diam., convex to subcampanulate, but more or less plane when mature, not papillate, viscid, glabrous to slightly rugose to the margin when old, even to translucent-striate, or somewhat sulcate when dry, hygrophanous, brownish to straw color or light yellowish to milk white when dry from the top to the margin, readily stains blue-green when touched or injured.

Lamellae adnate, thin, dark brown or grayish yellow with greenish tones, edges whitish or concolorous.

Stipe 20-35 (-45) $\times$ 1-2 (-2.5) mm, equal, slightly subbulbous, smooth to striate, yellowish to brownish toward the base or whitish when dry, bluing very easily, with long conspicuous, whitish rhizomorphs at the base.

Veil not well developed in adults. Lacking of annulus.

Context whitish, staining blue easily. Odor farinaceous, taste somewhat farinaceous.

Spore print purple violet brown.

Spores (7-) 8.8-11 (-13.8) (-16) $\times$ 6.6-7.7 (-8.8) $\times$ 6-6.6 μ m, elongate-ellipsoid to subovoid, both in face and side view, some mango shaped or asymmetric spores are common, with a thick complex wall (1-1.5 μ m) dark yellowish brown, with a broad germ pore (0.8-1.2 μ m) and a short appendage.

Basidia 15-20 (-28) $\times$ 6-11.5 μ m, 4-spored, hyaline, subcylindric to pyriform.

Pleurocystidia 12-25 (-35) $\times$ (3-) 5-10 (-15) μ m, hyaline, polymorphous, some are similar to the cheilocystidia near to the edge of the gill, but others on the face of the gill are fusiform-vesiculose or ampullaceous with a short papilla.

Cheilocystidia (18-) 22.8-36 $\times$ 5.5-8.8 (-10) μ m, hyaline, fusoid-ampullaceous with a long and simple neck 2-3.3 μ m in diameter, abundant, forming a sterile band, sometimes with an hyaline viscous drop at the apex.

Subhymenium hyaline to yellowish, seemingly subcellular with globose short elements to elongate hyaline hyphae. Trama regular with elongated hyaline hyphae, 5-10 μ m diameter. Epicutis composed of a thick gelatinous, hyaline layer of narrow hyphae. Hypodermium subhyaline to brownish, with elongate to subglobose hyphae, 10-20 μ m diameter. Clamp connections present.

STUDIED MATERIAL. CANADA, Province of Quebec, Jacques Cartier River Valley, Heim & Ola'h 092 (Type QUE; Isotypes PC & ENCB).

HABITAT AND DISTRIBUTION. Scattered to gregarious, on rotting wood, rarely on wood chips, in an *Abies-Betula* forest with *Alnus* and *Epicea*. Known only from the type locality. Fruiting in summer time.

DISCUSSION. The pleurocystidia separate *P. quebecensis* from *P. aztecorum* (both varieties) and *P. baeocystis* to which are very closely related. It is interesting to observe that *P. quebecensis* together with its related species form a triangular area from Mexico to Northwestern North America-Eastern Canada, as was discussed by Guzmán (1978b). It seems that *P. aztecorum* was the origin of *P. baeocystis* in the Northwest and of *P. quebecensis* in the Northeastern America. However more collection are necessary to establish the phylogeny of these species.

Ola'h (1967) and Ola'h & Heim (1967) isolated psilocybin and psilocin from both cultures and wild mushrooms. The fine structure of this species was studied by Ola'h (1973).

SELECTED ILLUSTRATIONS. Ola'h (1967, pls. I & II); Ola'h (1973, figs. 1-2).

Section *Cyanescens* Guzmán, sect. nov.

Pleurocystidiis hyalinis. Sporis subellipsoideis, usque ad 10 μm longis, crasse tunicatis. Carne caerulescente. Typus: *P. cyanescens* Wakef.

Bluing species with hyaline pleurocystidia and spores subellipsoid, up to 10 μm long, thick walled. It is interesting to note that the distribution of the known 5 species in this Section, 3 are endemic to Australasia, one is to North Africa and the other, *P. cyanescens* Wakef. has a boreal distribution (Europe and North America, but not in Mexico).

Species considered: 127. *P. australiana* Guzmán & Watling, 128. *P. cyanescens* Wakef., 129. *P. eucalypta* Guzmán & Watling, 130. *P. maire* Sing., and 131. *P. tasmaniana* Guzmán & Watling.

Key to species

- 1a. Pleurocystidia 30-35 μm long. Cheilocystidia 30-40 μm long. Known only from North Africa. 130. *P. maire*
- 1b. Pleurocystidia and cheilocystidia smaller than the above choice. 2
- 2a. Cheilocystidia with long necks (5-11 μm long). Pileus 10-20 mm diam. Lamellae broadly adnate. Growing on dung. Known only from Australia. 131. *P. tasmaniana*
- 2b. Cheilocystidia with short necks. Pileus much larger than 15 mm. Lamellae adnate to sinuate. Not fimicolous species. 3
- 3a. Spores larger, (10-) 12-14 (-16) μm long. Stipe sometimes with a floccose annulus. Cheilocystidia 17-23 μm long. 127. *P. australiana*
- 3b. Spores smaller, (8.8-) 11-12 (-14) μm long. 4
- 4a. Cheilocystidia (16-) 25-28 (-36) μm long. Spores up to 14 μm long. Species known only from Europe and the Northwestern U.S.A. 128. *P. cyanescens*
- 4a. Cheilocystidia 15-25 μm long. Spores up to 12.6 μm long. Species known only from Australia. 129. *P. eucalypta*

127. *Psilocybe australiana* Guzmán & Watling *Not. Roy. Bot. Gard. Edinb.* 36: 206, 1978. Figs. 573-576

Pileus 16-31 mm in diam., convex to subcampanulate or subumbonate, with slight umbo or sometimes with a short papilla, glabrous, even, but with white attached fibrils from the veil, subviscid, hygrophanous, dark ochraceous, frequently darker at center, fading to pale ochraceous buff or brownish yellow. Bluing mainly along the margin.

Lamellae adnate, with a olivaceous yellow or dark olivaceous color, finally purplish brown or violaceous grey, edges concolorous.

Stipe 45-110 $\times$ 2-3 mm, equal and cylindric, but slightly subbulbous (4-6 mm in diam. at the base), white to tawny or darker, silky fibrillose woolly strigose or tomentose. Bluing (blue-green) throughout on handling, staining darker grey when dry.

Veil well developed as a white arachnoid mass, but not forming a true annulus, but sometimes present as dark violaceous (from the spores) threads of fibrils at the stipe apex, like a subannulus or merely a fibrillose.

Context whitish. Odor and taste not checked.

Spores (10-) 12-14 (-16) $\times$ (5.5-) 6.7-7 (-7.7) $\times$ 6-7 μm , subellipsoid or ovate both in face and side view, thick walled, yellowish brown, with a flattened and broad germ pore.

Basidia 22-23 $\times$ 8-9 μm , 4-spored, sometimes 2-spored, subcylindric, hyaline.

Pleurocystidia 22-33 $\times$ 7.7-11 μm , hyaline, rare or more less abundant towards gill edge, lageniform with a short or long neck up to 5 $\times$ 2.5-7 μm .

Cheilocystidia 17-23 $\times$ 5.5-7.7 μm , abundant, forming a sterile band, fusoid ventricose or sublageniform with short or more or less long neck, but not more than 5 μm long, some with a hyaline viscous drop at the apex.

Subhymenium seemingly subcellular, composed of short to elongated elements yellowish orange, with irregularly incrustated walls. Trama more or less parallel, hyaline. Lactiferous hyphae more or less common, yellowish, 5-6 μm broad. Epicutis formed by a thin layer of gelatinized, brownish to hyaline narrow hyphae. Hypodermium hyaline, formed by subglobose to elongated hyphae, 4-9 μm broad. Clamp connections common.

HABITAT AND DISTRIBUTION. Gregarious on humus with woody of leafy debris, on tracks and roadsides, in *Pinus radiata* plantations, or in temperate or subtropical rain forest. Known only from southeastern Australia (New South Wales). Fruiting in April.

STUDIED MATERIAL. AUSTRALIA, New South Wales, near Canberra, Cotter Dam, Blue Range Block, *Watling 10617* (E, Type). Tidbinbilla Nature Reserve, *Watling 10549 & 10577* (E). Near Sydney, Mt. Wilson, *Watling 10888 & 10962* (E).

DISCUSSION. This species is close to *P. cyanescens* Wakef. but differs in the larger spores and smaller cheilocystidia. This fungus probably is a hallucinogenic species used in Australia as a recreational drug; those fungi reported by Southcott (1974), Hall (1973) and Shepherd & Hall (1973, according to Watling in Guzmán & Watling, 1978), probably belong to *P. australiana*, or *P. eucalypta* Guzmán & Watling and *P. tasmaniana* Guzmán & Watling, respectively (see Guzmán & Watling, 1978).

128. *Psilocybe cyanescens* Wakef. *Trans. Brit. Myc. Soc.* **29**: 141, 1946.
Figs. 578-583, 640, 772, 777-778 & Plate 8

Pileus (10-) 20-50 (-75) mm in diam., subconic or convex to campanulate, becoming irregularly expanded plano-convex or applanate to depressed, sometimes subumbonate, glabrous, even, but margin slightly striate when moist, viscid, hygrophanous, orangish brown, brownish red, grayish pinkish brown, or chestnut color, fading to yellowish, straw color, or ochraceous. Easily staining blue when touched or injured.

Lamellae adnate to sinuate, yellowish brown or orangish-brown to violaceous brown, sometimes somewhat mottled, with edges concolorous or nearly whitish.

Stipe (40-) 60-90 (-110) × (3-) 4-6 (-7) mm, equal, cylindrical or subbulbous, straight or sometimes irregularly flexuous, frequently with the base curved, hard and cartilaginous, solid to hollow, surface white to whitish, silky-fibrillose or scabrous toward the base. Readily changing to blue when bruised. Base with conspicuous white rhizomorphs.

Veil cortinate and well developed, delicate and white in young stages, evanescent in the adults or the remnants remains, fibrillate in the upper part of the stipe. Annulus not present.

Context yellowish and pliant or fleshy in the pileus, whitish to orangish-yellow and cartilaginous in the stipe mainly toward the base. Odor and taste farinaceous, but more strongly so in young fruit bodies. Easily staining blue when cut. KOH stains the context and the pileus reddish-yellow or reddish brown; in the stipe is brownish or not at all.

Spore print dark brown violet or fuscous.

Spores (8.8-) 11-13.2 (-15.4) × (6-) 6.6-7.7 (-8.5) × 5.5-7 μm, elongate-ellipsoid both face and side view or slightly broader in face view, thick walled (1-1.5 mm), dark yellowish brown, with a distinct broad apical germ pore.

Basidia 20-27 (-36) × 7-8.5 (-11) μm, 4-spored, rarely 2-spored, hyaline, vesiculose-subpyriform, sometimes with a slight median constriction.

Pleurocystidia 17-33 × 4.9-8.8 μm, hyaline, fusoid-ventricose or subpyriform but all the time mucronate, rarely with a more or less long neck, not so abundant, more frequently near to the edge of the gill.

Cheilocystidia (12-) 16-27 (-30) × (5-) 6.6-8.8 μm, hyaline, abundant, sublageniform or fusoid-ventricose, rarely pedicellate or with a more or less long cylindrical base, with a long neck, bifurcate or simple, up to 6 × 1.5-3.5 μm.

Subhymenium subhyaline or yellowish, with moderate amount of pigment and irregularly incrustated on the walls of the hyphae, seemingly subcellular with short elements. Trama regular, hyaline to yellowish, with hyphae walls non incrustated, and thin walled. Epicutis consisting of a subgelatinized thin layer of interwoven and loosely arranged hyaline narrow hyphae. Hypodermium hyaline to brownish, formed by compact globose to elongated hyphae, 10-70 μm thick, moderately incrustated. Clamp connections very common.

HABITAT AND DISTRIBUTION. Rarely scattered, more frequently gregarious, sometimes forming rings on humus or subignicolously on very rotten wood mixed with soil, or on sawdust or soil mulched containing wood chips or bark, in deciduous forests, but also very common in gardens under bushes, very rarely in grasses. Known from Great Britain, Netherlands, and Germany, and in the Northwestern North America, from Vancouver to California. Not known from the eastern North America. Fruiting in October to December.

STUDIED MATERIAL. CANADA, Vancouver, *Bandoni* s.n. (Oct. 9, 1965) (WTU as *P. pelliculosa*); *Guzmán* 16622; 16623; 16630; 16633; 16710 (all in ENCB); *Pollock* 10-26-76 (ENCB).

U.S.A., California, San Francisco, Golden Gate Park, *Thiers* 24723; 26886 & 32138 (SFSU); *Duncan* s.n. (12-6-74) (Vergeer Herb.; ENCB); *Ower* s.n. (3-9-75) (Vergeer Herb.); *Vergeer* 11-74 (Vergeer Herb.). Mt. Sutro, *Stevens & Orr* s.n. (12-8-1975) (Vergeer Herb.). Oregon, Portland, *Oswald* s.n. (Dec. 1, 1960) (MICH); *Guetz* s.n. (Oct. 30, 1960) (MICH); *Guzmán* 16642; 16644 (ENCB). Eugene, *Sipe* 1281 (MICH). Milwaukee, *Shoemaker* s.n. (Oct. 30, 1960) (MICH). Lane, *Leslie* 3951; 3972 (ENCB). Siltcoos Station, Westlake, *Menser* 887; 4502; 4504 & 4551 (ENCB); *Guzmán* 16648, 16670 (ENCB). Philomath, *Menser* 4528 (ENCB). Canary, *Menser* 4567. Washington, Mercer Island, *Chilton et al.* 75-2 (ENCB); *Leslie* 2759 (ENCB). Olympia, *Leslie* 2732; 3692; 3835; 3854 & 4021 (all in ENCB); *Guzmán* 16640 (ENCB); *Bigwood* 04 (ENCB). Near Tacoma, *Stamets* 78-34 (ENCB). Seattle, *Benedict & Brady* 1961 (part) (MICH; ENCB); *Benedict & Brady* 1962 (part) (MICH; ENCB); *Guzmán* 16600; 16601; 16612 (all in ENCB); *Rafaneldi* s.n. (Oct. 26, 1970) (WTU 16383 as *P. baecystis*).

GREAT BRITAIN, Edinburgh, Royal Botanical Garden, *Henderson* 1213 (E); *Harrison* 4016 (E); *Watling* 5354 (E).

HOLLAND, Gelderland, Warnsbom, *Tjallingii-Beukers*, s.n. (Nov. 4, 1975) (L).

DISCUSSION. The type was not examined by the author, who has based his interpretation of this species on European collections from England (type locality) and from Netherlands, which were identified by Watling and by Tjallingii-Beukers, respectively (this latter reported by Tjallingii-Beukers, 1976), and in the study of Wakefield's description (in Dennis & Wakefield, 1946) and in Singer & Smith (1958b). This species is close to *P. serbica* Moser & Horak and *P. liniformans* Guzmán & Bas, but those species do not have pleurocystidia. It is also close to *P. maire* Sing., but this species has very long pleurocystidia.

This species is one of the more common hallucinogenic fungi in Northwest of North America and is unfortunately used by the young people as a recreation drug. Benedict *et al.* (1962) and Tyler & Stuntz (1962) reported on the chemistry of this fungus, but see discussion in *P. stuntzii* Guzmán & Ott concerning the confusion of the material used by Benedict *et al.* (1962). It is interesting to see that *P. cyanescens* is very common in the Northwestern North America, and apparently rare in Europe and unknown in the Eastern U.S.A.; it may have been introduced to Europe from the Northwestern North America, but more explorations are necessary to learn the exact distribution of *P. cyanescens*. The references of Singer & Smith (1958b),

Dennis & Wakefield (1946), Tjallingii-Beukers (1976), Pegler (1966b), and Bresinsky & Haas (1976) seem to be the only reports of this species from Europe. Smith (in Benedict *et al.*, 1962) reported *P. cyanescens* from Northwestern U.S.A. Guzmán *et al.* (1976) and Duffy & Vergeer (1977) reported *P. cyanescens* from the Western North America. The report of *P. maire* from California (U.S.A.) by Duffy & Vergeer (1977) is probably *P. cyanescens* which is further discussed below.

There was some confusion of the identification of those specimens collected by Duncan in San Francisco, California. The wild fruit bodies were identified by Singer as probably *P. maire*. Duncan made a culture and the cultured fruit bodies were passed to J. Bigwood who showed them to Singer who identified them as *P. subaeruginascens* Höhnelt. But it seems that there was some mistake with the culture labels, because the cultured fungus showed to Singer has a ring, and is really *P. subcubensis* Guzmán (see discussion of this). On the other hand, the specimens collected by Ower (3-9-75) in California were identified by Singer as *P. maire*, even though they have cheilocystidia and pleurocystidia exactly like those of the typical *P. cyanescens*. Cultures of *P. cyanescens* are deposited in the Institute for Fermentation at Osaka (Japan), as well as in many North American institutions.

The name of the species refers to the conspicuous blue-green color of this fungus when touched or cut, as is characteristic in all the hallucinogenic species.

SELECTED ILLUSTRATIONS. Ott & Bigwood (1978, fig. 7); Stamets (1978, fig. 18).

129. **Psilocybe eucalypta** Guzmán & Watling *Not. Roy. Bot. Gard. Edinb.* **36**: 205, 1978. Figs. 584, 585-587

Pileus 15-38 mm in diam., convex to expanded, with a central shallow umbo, glabrous and even, but slightly striate at the margin, viscid, hygrophanous, red brownish to brown or bright ochraceous, fading to dull fulvous or straw color.

Lamellae adnate, purplish brown, then olive-brown or dark violaceous grey, with whitish edges.

Stipe 65-86 × 2-2.5 mm, equal except for a subbulbous base 4-5 mm broad, whitish tawny, covered with silky fibrils, wooly tomentose at the base with whitish buff mycelium, bluing or staining greenish principally at the base.

Veil rudimentary as a white cortina soon evanescent.

Context whitish, somewhat bluing. Odor and taste not checked.

Spores (9.3-) 9.9-12 (-13) × (6-) 6.6-7.1 × 5.5-6.6 μm, subellipsoid both in face and side view, thick walled (1.5 mm), yellowish brown, with a broad, flattened germ pore.

Basidia 28-40 × 7.7-9.9 μm, 4-spored, hyaline, cylindric or subpyriform, some with a median constriction.

Pleurocystidia 17-30 × 5.5-7.7 μm, hyaline, fusoid-ventricose or mucronate to sub-

lageniform, with very short necks, 2-3 μm broad; some with a subhyaline or greyish blue drop, 3.3-8.8 μm diameter at the apex.

Cheilocystidia 15-25 × 4.4-6.6 μm, abundant, forming a sterile band, hyaline, fusoid-ventricose or sublageniform, some are slightly pedicellate; neck 3-4 μm broad, up to 4-5 μm long.

Subhymenium hyaline or grayish, seemingly subcellular with irregular globose or subelongate hyphae, sometimes with diffused yellowish or greyish blue pigment (in KOH solution). Trama parallel, with hyaline elongated hyphae 3.3-5.5 μm broad. Epicutis formed by a thin hyaline or brownish subgelatinous layer of elongated hyphae. Hypodermium composed of brownish, globose to elongated hyphae, not incrustated. Lactiferous yellowish hyphae, 3.3-4.4 μm broad are more or less common. Clamp connections present.

HABITAT AND DISTRIBUTION. Solitary or gregarious in small groups, on soil amongst grass-wood debris, or amongst mosses, in shallow groves of *Eucalyptus*. Known only from eastern Australia (New South Wales). Fruiting in April.

STUDIED MATERIAL. AUSTRALIA, New South Wales, near Canberra, Tidhinbilla Nature Reserve, *Watling 10656* (Type, E). Near Queanbeyan, Talaganda Forest Reserve, *Watling 10631* (E). Near Sydney, Mt. Wilson, *Watling 10656* (E).

DISCUSSION. *P. eucalypta* is very close to *P. cyanescens* Wakef. but the size of the spores and cheilocystidia as well as the geographical distribution, seems to separate both (see the Key). As which *P. australiana* Guzmán & Watling, this is probably a hallucinogenic fungus.

The name of the species refers to the *Eucalyptus* forests where this fungus grows.

130. **Psilocybe maire** Sing. *Sydowia* **7**: 84, 1973.

Hypholoma cyanescens Maire, *Bull. Soc. Myc. Fr.* **44**: 51, 1928.
Geophila cyanescens (Maire) Kühner & Romagnesi, *Fl. Anal. Champ. Sup.*, p. 337, 1953.

Pileus 15-25 (-35) μm in diam., convex to campanulate or conic-campanulate, then expanding, not umbonate, glabrous, even, with the margin faintly striate when humid, viscid, with a separable gelatinous pellicle, hygrophanous, ochraceous with a bister tone, finally dusky olive, fading to yellowish white or dull stramineous from the disc to the margin, staining blue where touched injured.

Lamellae adnexed, whitish or pallid argillaceous when young, when mature becoming lilac-beige to purple brown or light rufous-fuscos, with edges whitish pruinose.

Stipe (25-) 40-75 × 2-3 (-5) mm, equal or subequal or slightly enlarged below, solid to pseudo fistulose, stuffed with a white silky medulla, white to whitish or yellowish, pruinose on the apex, innately fibrillose downward. Basal mycelium cottony white, agglutinating, with long white rhizomorphs, 0.5 mm thick.

Veil cortinate, white, fugacious, except for the fibrils on the stipe.

Context amber color or fulvous, darker in the stipe, bluing in all regions when bruished. Odor farinaceous, taste mild to somewhat farinaceous.

Spore print purplish blackish or purple brown.

Spores (10-) 11-12 (-13.5) $\times$ 5.5-6.2 (-7) μm , elongate-ellipsoid both in side and lateral view, thick walled, yellow-brown or light fuscous brown, with an apical broad germ pore and a short appendage.

Basidia 25-35 $\times$ 7.5-9 μm , 4-spored, hyaline, cylindrical or constricted, with sterigmata 5 μm long.

Pleurocystidia absent or similar to the cheilocystidia and near the gill edge; fusoid or sublageniform, 30-35 $\times$ 6-7.5 μm .

Cheilocystidia 30-40 $\times$ 6-8 μm , hyaline, abundant, forming a sterile band, lageniform, fusiform or ampullaceous, with the apex often incrustated with calcium oxalate.

Subhymenium seemingly subcellular, hyaline. Hymenopodium formed of more or less parallel broad hyphae. Trama regular, with elements 5-8 μm in diameter. Epicutis as a gelatinized, thin layer composed of narrow hyaline hyphae. Hypodermium with elongated hyphae. Upper part of the stipe with caulocystidia. Clamp connections present.

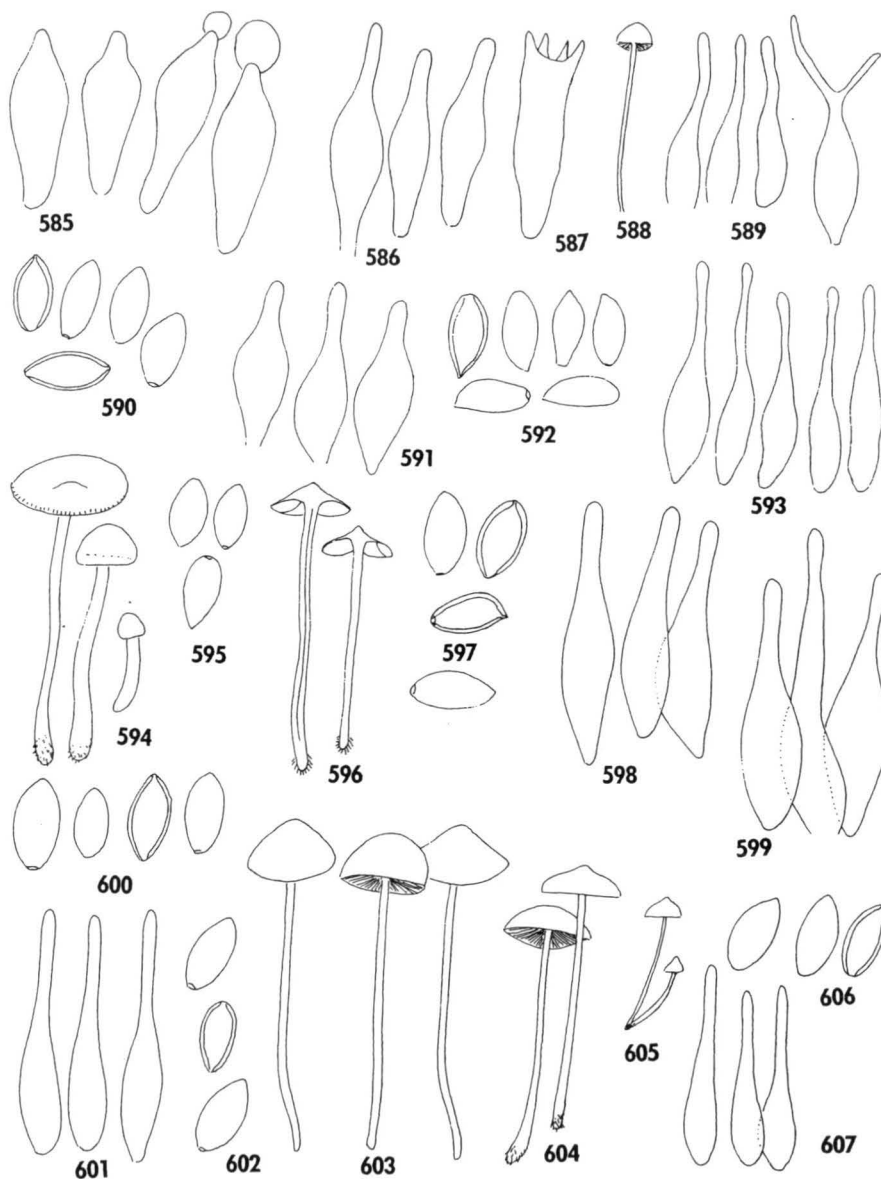


Plate 39: Figs. 585-607. - Several species of *Psilocybe*. 585-587: *P. eucalypta*, 585: Pleurocystidia, 586: Cheilocystidia, 587: Basidium (all from the type). 589-591: *P. tasmaniana*, 588: Carpophores, 589: Cheilocystidia, 590: Spores, 591: Pleurocystidia (588-589: Watling 16714; 590-591: Watling 10332). 592-595: *P. caerulipes*, 592: Spores, 593: Cheilocystidia, 594: Carpophores, 595: Spores (592-593: type; 594-595: Guzmán 2675). 596-603: *P. callosa*, 596: Carpophores, 597: Spores, 598-599: Cheilocystidia, 600: Spores, 601: Cheilocystidia, 602: Spores, 603-604: Carpophores (596-598: Huijsman; 599-600 & 604: type of *P. strictipes*; 601-602: type of *P. semilanceata* var. *microspora*; 603 from Cooke plate). 605-607: *P. carbonaria*, 605: Carpophores, 606: Spores, 607: Cheilocystidia (all from the type).

HABITAT AND DISTRIBUTION. Gregarious on soil or humus or on small rotting pieces of wood in the soil, in *Cedrus atlantica*, *Abies pinsapo*, *Pinus pinaster*, *Quercus ilicis* and *Q. pyrenaica* forest. Known only from North Africa. Reported from Morocco (Rif and Moyen Atlas) and Algeria (Blida and La Chr  a). Fruiting from October to December (Maire, 1928; Malen  on, 1942; Malen  on & Bertault, 1970).

HERBARIUM MATERIAL: none studied.

DISCUSSION. This species is very close to *P. cyanescens* Wakef. seeming to differ only in the size of their cheilocystidia, (12-) 16-27 (-30) μm long in *P. cyanescens* vs. 30-40 μm long in *P. maire*, and in their geographical distribution. Unfortunately it was impossible for the author to study the type. The description presented here was adapted from Maire's (1928), Malen  on's (1942) and Malen  on & Bertault's (1970), as well as from Singer & Smith's (1958b) interpretations. Singer (1973) did not present any description or discussion of this species, only the new name, in honor of R. Maire. The reference of *P. maire* from Europe (Derbsch, 1976) seems to belong to *P. serbica* because of the size of the cheilocystidia reported. Further, the herbarium material from Czechoslovakia in BRA, identified as *P. maire* by Kuthan and confirmed by Singer, belongs to both *P. serbica* and *P. atrobrunnea* (Lasch) Gill., which the author had the opportunity to study (see Material Studied in *P. serbica* and *P. atrobrunnea*). The same is probably true with Kubicka's collections from Czechoslovakia, also in PR (Numbs. 619788 and 613004), and identified by Horak as *Hypholoma cyanescens* Mre., or they may belong to *P. serbica* Moser & Horak. K  hner and Romagnesi (1953) reported *Geophila cyanescens* but they did not give any additional information than that which was reported by Maire and Malen  on.

P. collybioides Sing. & Smith which Singer (1958b) related to *Hypholoma cyanescens* Maire is actually an independent species, belonging to the Sect. *Zapotecorum* (see that). *P. maire* reported from California (U.S.A.) (Duffy & Vergeer, 1977) may well belongs to *P. cyanescens* (see discussion of that). The cultures of *P. maire* reported by Semerdzieva & Musilek (1976) and deposited in their Institute, probably belong to *P. serbica* Moser & Horak (see discussion of *P. coprinifacies* (Roll.) Pouz. in doubtful species).

131. ***Psilocybe tasmaniana*** Guzm  n & Watling *Not. Roy. Bot. Gard. Edinb.* 36: 207, 1978
Figs. 589-591

Pileus 10-20 mm in diam., convex to subcampanulate, neither papillate nor umbonate, glabrous, but margin with whitish flecks or appendiculate remains from the veil, even, but slightly striate at the margin when moist, subviscid, hygrophanous, tawny orange, drying dull or ochraceous straw-color.

Lamellae broad adnate, violaceous brown with whitish edges.

Stipe 40-50 $\times$ 1-2 mm, cylindrical and equal, silky fibrillose, white to almost concolorous with the pileus. Slightly bluish green at the base.

Veil well developed as a white arachnoid mass, but not forming any annulus.

Context pallid or whitish. Odor and taste not recorded.

Spores (10-) 12-13 (-15.4) $\times$ 7.1-7.7 (-8.8) μm , ellipsoid or subellipsoid in side view or subovate in face view, thick-walled, dark brownish yellow with an apical and broad germ pore.

Basidia 22-33 $\times$ 5.5-9.9 μm , 4-spored, hyaline, subcylindric.

Pleurocystidia 19-24 $\times$ 6.6-8.8 μm , hyaline, fusoid-ventricose with short neck 1.6-2.7 μm diam., more abundant towards the gill-edge.

Cheilocystidia 22-23 $\times$ 4.4-9.9 μm , abundant, hyaline, globose-ventricose, fusoid-ventricose or sublageniform, with long neck 5-11 $\times$ 1.6-3.3 μm , some bifurcate and others with a hyaline drop at the apex.

Subhymenium seemingly subcellular with short elements, with brownish yellow pigment irregularly distributed or incrustated on the hyphal walls. Trama parallel, hyaline, with elongated hyphae 4-6 μm broad. Epicutis as a gelatinized thin layer, formed of parallel, brownish to hyaline narrow hyphae, not more than 3 μm broad. Hypodermium with brownish to hyaline, with subglobose to elongated hyphae, 5-10 μm broad. Clamp connections present.

HABITAT AND DISTRIBUTION. Solitary or gregarious in small groups on dung or on debris (wood and leaves) intermixed with dung (some collections were made directly from dung which probably originated from Kangaroo), in *Eucalyptus* forests, or in grassy areas. Known only from Tasmania and Southeastern Australia. Fruiting in April and May.

STUDIED MATERIAL. AUSTRALIA, New South Wales, Near Camberra, Tidbinbilla Nature Reserve, *Watling 10714* (E).

TASMANIA, Northeastern Hobart, Nugget, Buckland, *Watling 10393* (Type E); *Watling 10332* (E, ENCB). Mt. Field Nat. Park, *Watling 11993* (E).

DISCUSSION. This species is tentatively considered in this Section even though the bluing feature which was not well observed. For the pleurocystidia and spores it is close to *P. cyanescens* Wakef., but the form of the cheilocystidia and fruit bodies and the coprophilous habitat differ from that species. Guzm  n & Watling (1978) related this species with *P. subaeruginosa* Clel., an hallucinogenic species endemic from Australasia (see Sect. *Subaeruginosae*).

Section Semilanceatae Guzmán, Sect. nov.

Sporis subellipsoideis crassutunicatis vel subtenuis. Pleurocystidiis nullis. Carne caerulescente. Species temperatus. Typus: *P. semilanceata* (Fr. ex Secr.) Kumm.

Spores subellipsoid, thick (1-2 μm) or more or less thin (0.5 μm) walled. Without pleurocystidia. Bluish (except for some not well known species such as *P. carbonaria* Sing. This section is a modern interpretation of the confuse Section *Tenaces* (Fr.) Sacc., where Saccardo (1887) considered several now excluded or doubtful species. Sect. *Tenaces* was accepted by Singer (1975) with *P. semilanceata* as type.

Species considered: 132. *P. caerulipes* (Peck) Sacc., 133. *P. callosa* (Fr. ex Fr.) Quél., 134. *P. carbonaria* Sing., 135. *P. cyanofibrillosa* Guzmán & Stamets, 136. *P. fimetaria* (Orton) Watling, 137. *P. liniformans* Guzmán & Bas var. *liniformans*, 138. *P. liniformans* var. *americana* Guzmán & Stamets, 139. *P. pelliculosa* (Smith) Sing. & Smith, 140. *P. semilanceata* (Fr. ex Secr.) Kumm., 141. *P. serbica* Moser & Horak, 142. *P. silvatica* (Peck) Sing. & Smith, 143. *P. subfimetaria* Guzmán & Smith, and 144. *P. venenata* (Imai) Imaz. & Hongo.

Key to species

- 1a. Annulus present, or at the least a fibrillose zone or subannulus is developed on the stipe. 2
- 1b. Annulus never present, without fibrils on the stipe. 4
- 2a. Annulus more or less membranous and permanent. Spores (8-) 9.9-12 (-14) $\times$ 6-7 (-8.8) μm . Habitat variable, on soil, rotten wood, straw or dung. Known only from Japan. 144. *P. venenata*
- 2b. Annulus fibrillose. 3
- 3a. Spores (9.9-) 11-12 (-12.6) μm long. Fimicolous or subfimicolous, only known from North America. 143. *P. subfimetaria*
- 3b. Spores (9.5-) 11-14 (-16) μm long. Fimicolous or subfimicolous, known from Europe, NW North America and South America. 136. *P. fimetaria*
- 4a. Pileus conic (Mycenoid type) at maturity. 5
- 4b. Pileus convex (Collybioid type) at maturity. 8
- 5a. Spores smaller, not more than 13 μm long. 6
- 5b. Spores larger, more than 13 μm long. 7
- 6a. Spores (8.2-) 9.3-11 (-13) μm long. Growing only in northwestern North America. 139. *P. pelliculosa*
- 6b. Spores (6.6-) 8.5-9.5 (-11) μm long. Growing in both northwestern and northeastern North America and in Central Europe. 124. *P. silvatica*

- 7a. Spores (10.4-) 12-13 (14.5) μm long. Cheilocystidia 23-28 μm long. Known only from Chile. 134. *P. carbonaria*
- 7b. Spores (11-) 12-14 (-16) (-18) μm long. Cheilocystidia 18-32 (-35) μm long. Widespread in temperate regions. 140. *P. semilanceata*
- 8a. Spores large, (12-) 13-14.5 (-16.5) μm long. 9
- 8b. Spores smaller than the above choice. 10
- 9a. Edge of the lamellae with a gelatinous layer. Fimicolous species. Known only in Netherlands. 137. *P. liniformans* var. *liniformans*
- 9b. Edge of the lamellae without a gelatinous layer. Terricolous species. Known only in North and South America. 138. *P. liniformans* var. *americana*
- 10a. Cheilocystidia arising from hyphae parallel along the edge of the gill. Spores (9-) 10-11 (-13) $\times$ 5.5-6.5 (-7.5) μm . Growing mainly in forests. Known only in Europe. 141. *P. serbica*
- 10b. Cheilocystidia arising from hyphae more or less in radiate arrangement relative to the edge of the gill. 11
- 11a. Spores small, (7-) 8.2-9.9 (-11) $\times$ 3.8-5.5 (-6) μm . Cheilocystidia 18-35 μm long. Growing on rotten wood. Known only from Eastern Canada and U.S.A. and Gulf of Mexico coast. 132. *P. caerulipes*
- 11b. Spores larger than the above choice. Growing on soil. 12
- 12a. Spores (8.5-) 10-12 (-13.5) $\times$ (5.5-) 6-6.6 (-8) μm . Cheilocystidia 21-46 (-50) μm long. 133. *P. callosa*
- 12b. Spores (9-) 9.5-11 (-12) $\times$ (5.5-) 6-6.6 (-7.1) μm . Cheilocystidia 22-33 μm long. Known only in the state of Washington (U.S.A.). 135. *P. cyanofibrillosa*

132. *Psilocybe caerulipes* (Peck) Sacc. *Syll. Fung.* 5: 1051, 1887. Figs. 592-595 & 697

Agaricus caerulipes Peck, *Ann. Rep. N. Y. State Mus.* 38: 89, 1885.

Pileus 10-30 (-40) mm in diam., obtusely conic when young to convex when mature, becoming broadly convex to plane or retaining a slight umbo, surface glabrous, even but slightly striate at the margin when humid, viscid to subviscid, hygrophanous, soon dry and shining, watery cinnamon brown or reddish brown, fading to ochraceous buff, sordid alutaceous or brownish yellow, often with greenish stains along the margin or with a greenish tinge throughout. Bluish when touched or injured.

Lamellae adnate to adnexed or short subdecurrent, close to crowded, sordid brown when young, becoming rusty cinnamon or ferrugineous brown, sometimes somewhat mottled, edges whitish and slightly fimbriate.

Stipe 30-60 (-70) $\times$ 2-3 (-4) mm, equal or slightly enlarged downwards, tough,

hollow or stuffed with a white floccose pith; surface whitish to reddish brown, apex pruinose with superior fibrillose white zone of remnants of the veil, appressed fibrillose and whitish downward but usually staining greenish blue when touched or injured, appearing pallid or bluish when dried.

Veil as white arachnoid fibrils well developed in young stages, but not forming any annulus in the mature stage.

Context in pileus thin and pliant, in stipe tough, in both whitish to reddish brown, becoming bluish when injured. Odor slightly farinaceous. Taste farinaceous.

Spore print very dark purple brown.

Spores (7-) 8.2-9.9 (-11) $\times$ 3.8-5.5 (-6) $\times$ 3.8-5 μ m, ellipsoid or subellipsoid both in face and side view, somewhat inequilateral in side view at times, thick-walled (1 μ m), pale yellowish brown, with a plane and broad germ pore. Sometimes with abnormal spores, with two germ pores present (the larger spores are from the 2-spored basidia).

Basidia 15-28 $\times$ 5-8 μ m, 4-spored, some 2-spored, hyaline, ventricose, but often constricted in mid-portion.

Pleurocystidia absent.

Cheilocystidia 18-35 $\times$ 4.5-7.5 μ m, abundant, forming a sterile band, hyaline, thin walled, lageniform or sublageniform with a short to long and flexuous neck 1-2.4 μ m broad; some are subventricose, with a bifurcate apex. Sometimes with a somewhat viscous hyaline drop at the apex, 5-20 μ m diam.

Subhymenium subcellular, formed by short globose elements, hyaline to pale brownish. Trama parallel, hyaline to pale brownish, with thin to thick (1.5 μ m) walled hyphae, 4-24 μ m broad. Epicutis composed of a hyaline gelatinous, thin pellicle, formed with elongated and parallel hyphae, 2-4.5 μ m broad. Hypodermium subcellular, subhyaline to pale brownish, pigment not incrustated, with elements 6-15 μ m diam. Clamp connections present.

HABITAT AND DISTRIBUTION. Solitary or more commonly densely caespitose, or sometimes gregarious, on rotten wood covered by or free of mosses, in deciduous forests. Fruiting in summer and fall, more rarely in early winter. Known only from eastern U.S.A., Canada, and eastern Mexico.

The record from Mexico is the southern most in North America, and it is interesting to note that this ecological zone included forests of *Fagus*, a tree very common in eastern U.S.A. and Central Europe. The Mexican locality of *Fagus* is the most southern known in America (Rzedowski, 1978).

STUDIED MATERIAL. U.S.A., Michigan, Pontiac, *Smith* 7268 (MICH). Lake Michigan near Wilderness, *Thiers* 22619 (SFSU). Tahquamenon Falls State Park, *Smith* 37428 (MICH), *Smith* 861 (BPI); 50312 (MICH); *Guzmán* U-276 (ENCB); *Dubin* 207 (BPI); *Mcknight* 11548 (BPI); *Watling* 1539-C (E). Cheboygan, *Watling* 7101 (E). Emmet, Cross Village, *Guzmán* U-497 (ENCB). Chippewa, *Snell* A-113 (E); *Watling* 6713 & 7007 (E). New York, Albany, South Ballston, *Peck* s.n. (NYS

Type). Round Lake, *Peck* s.n. (NYS). Ohio, Cleveland, *Walters* 186 (MICH). Tennessee, Great Mts. Nat. Park, Grassy Patch, *Smith* 10545 (MICH; TENN 12423).

MEXICO, State of Hidalgo, Southeastern Zacualtipan, zone of "Bosque de hayas", *Guzmán* 2675 & 2680 (ENCB).

DISCUSSION. This species is close to *P. venenata* (Imai) Imaz. & Hongo but differs in the size of the spores (which are larger in that species), has a more developed veil and a different habitat (see that). *Guzmán* (1963) reported *P. caerulipes* from Mexico, but the report of Singer (1958a) of *P. caerulipes* var. *gastonii* Sing. is inaccurate, because Singer's taxon is synonym with *P. hoogshagenii* Heim var. *hoogshagenii* (*Guzmán*, 1978c). Murrill (1923), *Smith* & *Hesler* (1938) and *Miller* (1972) reported *P. caerulipes* from North America. This is an hallucinogenic fungus (*Singer* & *Smith*, 1958b); containing psilocybin and psilocin according to *Leung et al.* (1965). *P. subcaerulipes* Hongo (Sect. *Zapotecorum*) is an independent species.

The name of the species refers to the stipe, which when touched or injured turns blue-green, so typical several hallucinogenic species.

133. *Psilocybe callosa* (Fr. ex Fr.) Quél. *Champ. Jura et Vosges*, p. 257, 1872.

Figs. 596-603 & 699

Agaricus callosus Fr., *Observ. Mycol.* 2, p. 180, 1818.

A. callosus Fr., *Syst. Myc.* 1, p. 292, 1821.

Coprinarius callosus (Fr. ex Fr.) Kumm., *Führ. Pilzk.*, p. 69, 1871.

Agaricus semilanceatus var. *caerulescens* Cke., *Illustr. Brit. Fung.* No. 605, pl. 573, 1881.

Geophila callosa (Fr. ex Fr.) Quél., *Ench. Fung.*, p. 115, 1886.

Psilocybe semilanceata var. *caerulescens* (Cke.) Sacc., *Syll. Fung.* 5: 1051, 1887.

P. strictipes Sing. & *Smith*, *Mycologia* 50: 141, 1958.

P. cookei Sing., *Beih. Sydowia* 7: 84, 1973 (non *P. cookei* Sacc., *Syll. Fung.* 5: 1043, a probably synonym of *Psathyrella sarcocephala* (Fr.) Sing.).

P. semilanceata var. *microspora* Sing., *Nova Hedwigia* 29: 247, 1969.

P. semilanceata var. *obtusa* Bon, *Bull. Soc. Myc. Fr.* 86: 114, 1970. Nom. nud.

Pileus (5-) 15-25 (-35) mm in diam., conic to convex or campanulate or subumbonate, slightly papillate, becoming broadly expanded, glabrous, even but slightly striate at the margin when moist, viscid to subviscid, with a separable pellicle when fresh and young, hygrophanous, dark greyish brown or yellowish brown, fading to cinnamon buff, straw color or whitish yellow. Bluish when injured.

Lamellae broadly adnate to shortly subdecurrent, eventually free in dry specimens, pallid brownish to more or less chocolate brown, or grayish violaceous, except for the somewhat whitish edges.

Stipe (40-) 55-70 (-130) $\times$ (1.5-) 2-3 mm, equal or subbulbous, straight to flexuous, tough or cartilaginous, stuffed to hollow, surface white or yellow to reddish brown, fibrillose, somewhat mottled by white floccose fibrils from the veil; base with short rhizomorphs. Staining blue where injured.

Veil as arachnoid with white fibrils in young stages, evanescent, but not leaving an annulus in the adults.

Context in the pileus fleshy, whitish to concolorous with the surface; in the stipe tough and brownish. Bluish when cut. Odor and taste farinaceous in young stages to more or less absent in the adults. KOH staining the pileus and context reddish brown, but not on the stipe.

Spore print dark purpuraceous brown.

Spores (8.5-) 10-12 (-13.2) $\times$ (5.5-) 6-6.6 (-8) μm , subellipsoid or suboblong both in face and side view or somewhat inequilateral in side view, yellowish brown, with a thick wall (1.5 μm) and a broad germ pore.

Basidia 23-33 $\times$ 6.6-12 μm , 4-spored, hyaline, clavate to subcylindrical with a median constriction, frequently with a clamp connection at the base.

Pleurocystidia absent.

Cheilocystidia 21-46 (-50) $\times$ 7-10 μm , abundant, forming a sterile band, hyaline, thin walled, lageniform or sublageniform with long neck 2-3.6 μm broad.

Subhymenium seemingly subcellular with short elements with yellowish brown or orangish pigment irregularly incrustated on the walls. Trama parallel, formed by elongated, thin to almost (1 μm) hyaline or brownish hyphae. Epicutis formed by a hyaline, gelatinized, thin to thick layer of parallel narrow hyphae, 1.5-3.5 μm diam. Hypodermium with subglobose to elongated hyaline or brownish hyphae, 6-12 μm diam., with no incrustated pigment. In the inner part some globose hyphae, up to 40 μm diam. are present. Clamp connections present.

HABITAT AND DISTRIBUTION. Gregarious, rarely solitary on soil, mainly on rich soil in fields, lawns, roadsides, and grasslands, rarely on humus in open forests (mixed or coniferous). Known from Europe and Northwestern North America, and in South America (Chile), but unknown in Mexico. Fruiting in the summer and fall.

STUDIED MATERIAL. CANADA, British Columbia, Vancouver, Kitsilano Distr., Haard & Pollock s.n. (Oct. 28, 1975) (ENCB). Barston Island, Pollock s.n. (Oct. 26, 1976) (ENCB). Duncan, Paden s.n. (Nov. 1, 1973 & Nov. 21, 1974) (ENCB). Graham Island, Delkatla Flats Bird Sanctuary, McLaughlin 2 (ENCB).

U.S.A., Oregon, near Welcher, Gruber & Smith 20248 (MICH, Type of *P. stric-tipes*). Clatsop, Rodeo Grounds, Menser 564; 856 & 4539 (ENCB). Sixes, Ott 75-19 (ENCB) (Reported as *P. pelliculosa* by Guzmán *et al.*, 1976). Sitcoos, Guzmán 16653; (ENCB); 16658 (ENCB; NY). Washington, Little Rock, Ott 75-3 (ENCB). Tenino, Thurston, Staments 77-21 (ENCB). Olympia, Halpen s.n. (Oct. 29, 1975) (ENCB); Guzmán 16611 (ENCB). Near Seattle, Guzmán 16603 (ENCB). Near Quinalt, Grays Harbor, Leslie 2647 (ENCB).

CHILE, Valdiviana, Cordillera Pelada, Singer M-3236 (BAFC Type of *P. semilanceata* var. *microspora*).

CZECHOSLOVAKIA, Soberlav-Blata, Kotlaba s.n. (PR 192156 as *P. semilanceata*). Bohemia, Olesvoice, Kult s.n. (Aug. 18, 1957) (PR 703965 as *P. semilanceata*).

ENGLAND, Surrey, Kew, Tennant s.n. (Nov. 6, 1962) (K as *P. semilanceata*). FINLAND, Mustiala, Tammela, Taventia, Karsten 1565 (H as *P. semilanceata*). FRANCE, Without locality, Bon 72121312 (Bon Herb. as *P. semilanceata*). Nansles-Pins, Huijsman s.n. (Sept. 28, 1960) (L 3915-1). La Tour de Salvagns, Rhone, Jossierard s.n. (5-10-1937) (MICH as *P. semilanceata*). Laronville, near Abbeville, Bon 91178 (Bon Herb. as *P. semilanceata*; ENCB). Vendic, Bon 73110425 (Bon Herb. as *P. apeliculosa*) (tentatively). Bon s.n., without locality (Bon Herb. as *P. semilanceata* var. *obtusa*). GERMANY, Without locality, Hennings s.n. (1887) (NY as *P. semilanceata*). HOLLAND, Leiden-The Hague, Bas s.n. (Oct. 29, 1969) (L). SWEDEN, Drottningholm, Lloyd 42506 (BPI as *P. semilanceata*). Vasterg, Goteborg, Nathorst-Windahl 6288 (GB as *P. semilanceata*). Blekinge, Natraby, Lundell & Wikland 2243 (UPS as *P. semilanceata*).

DISCUSSION. *P. callosa* as understood here follows Huijsman's concept (1961) which followed Fries' concept (1815-1818, 1821-1832 & 1836-1838). Fries (1836-1838, p. 230) described the fungus as: "*pileo carnosulo conico-camp. obtuso laevi glabro sicco, stipite fistuloso tenaci aegnali pallido, lamellis adnatis adscend, ventricosis fedigineo-nigris*" "*In graminosis ad vias*". However, Fries (1821-1832, p. 292) considered four varieties of *Agaricus callosus*:

- a. *pileo albo* Fries, *Obs. Mycol.* 2, p. 180, 1818.
- b. *pileo luteo* *A. semiglobatus*, Sowerb. t. 240, f. 1.
-*A. semilanceatus* Fries, l.c., p. 178
- c. *pileo livido*
- d. *pileo spadiceo*

It is very interesting that Fries (1821-1832) considered *P. semilanceata* as a variety of *Agaricus callosus*, as var. "b" "*pileo luteo. A. semiglobatus* Sowerb. t. 240 f. 1", but Sowerby's fungus belongs to that complex discussed by Heim (1971) (see discussion of *P. semilanceata*). *P. callosa* is in fact very close to *P. semilanceata* (Fr. ex Secr.) Kumm., but differs mainly in the short papilla of the pileus and in the smaller spores (11-) 12-14 (-16) (-18!) μm long in *P. semilanceata*. Konrad & Maublanc (1924-1937) considered *P. callosa* as a variety of *P. semilanceata*. Huijsmans (1961) described *P. callosa* as a fungus - short papillate, no hygrophanous, with spores ellipsoid, 10-12 $\times$ 6.2-7.8 μm , cheilocystidias sublageniform, 22-46 (-54) $\times$ 7-10 μm , neck 3-4 μm wide, and caulocystidia as the cheilocystidia in form and in size. All these features, except the "no hygrophanous" character agree well with the concept of *P. callosa* followed in the present monograph. Karsten (1876) was confused with the concept of *P. callosa*; he described a fungus with a conico-campanulate and obtuse pileus but the collection Karsten 1520 at H labelled as *Agaricus (Psilocybe) callosus* Fr. determined by Karsten (collected in Finland) is *Psathyrella* sp. (!), but the material Karsten 1565 at H, also from Finland and determined as *P. semilanceata*, belongs to *P. callosa*. Even specimens from Bresadola Herbarium determined as *P. callosa* (Leg. Rendi, Febr. 1924 at BPI) by Bresadola belongs really to *Psathyrella* sp. (!). The same is true of the material from Czechoslovakia collected by Bubak (Dec. 13, 1905), deposited at BPI and identified as *P. callosa*. Kühner & Romagnesi (1953) did not clearly *P. callosa* define.

Several collections of *P. callosa* from Europe are labelled as *P. semilanceata* in different herbaria (see Studied material). Bon (1970) described *P. semilanceata* var. *obtusata* Bon (nom. nud.) to include the form with convex pileus and small spores that really belong to *P. callosa*. Further some of Bon's materials determined as *P. semilanceata* var. *semilanceata* are *P. callosa*, e.g. specimens Bon 91178.

P. cookei Sing. is a synonymous with *P. callosa*. Singer (1973) based this species on *Agaricus semilanceatus* var. *caerulescens* Cooke (= *Psilocybe semilanceata* var. *caerulescens* (Cooke) Sacc.), but this Cooke's fungus (No. 605) (9 carpophores) shown in plate 573 of *British Fungi* (Cooke, 1881-1891), is surely *P. callosa* because the fungus has convex to campanulate or subumbonate, non papillate, neither conic pale brownish pileus. Cooke (1902-1906) reported *Psilocybe semilanceatus* var. *caerulescens* as "poisonous" in children, in a case known to him near London, in September of 1880 (actually this was an hallucinogenic intoxication). The specimen Singer C-5105 from Chrudim, Czechoslovakia (according to Singer's notes), identified by him as *P. cookei* Sing., is *P. semilanceata* (Fr. ex Secr.) Kumm. because of its papillate pileus and the large spores. *P. cookei* Sacc. is probably a synonym of *Psathyrella sarcocephala* (Fr.) Sing., because Saccardo (1887) based this fungus on Cooke's illustration No. 591, and not on No. 605, which is *Agaricus semilanceatus* var. *caerulescens*. He wrote "ad truncus" and he did not mention the bluing feature that seems absent in this fungus. Rea (1922) considered Saccardo's fungus as *Psilocybe sarcocephala* var. *cookei* (Sacc.) Rea (see Doubtful species).

P. strictipes Sing. & Smith is considered here as synonym with *P. callosa*, based on a careful study of the type (Smith 20248 at MICH). This material has the same features considered by Huijsman (1961) for distinguishing *P. callosa* and also agrees well with Cooke's plate. The epicutis in both types is formed by a gelatinous pellicle of hyaline narrow hyphae; the pleurocystidia are absent or they are as the cheilocystidia close to the edge of the gill, and the cheilocystidia and the spores are the same. However, several specimens identified by Smith as *P. strictipes* really belong to *P. baeocystis* Sing. & Smith emend. Guzmán, as was discussed in *P. baeocystis*. The specimen Smith 24403 (see Fig. 700) used by Singer & Smith (1958) to draw their Fig. 50 is *P. baeocystis* (!). This has caused to confuse "*P. strictipes*" with *P. baeocystis*, *P. cyanescens* and *P. callosa*. For example Fig. 26 of *P. strictipes* by Menser in Stamets (1978) is *P. baeocystis*. *P. semilanceata* var. *microspora* Sing. from Chile was at first considered as a synonym with *P. pelliculosa* (Smith) Sing. & Smith (Guzmán & Ott, 1976) but it is better to consider it now as synonym with *P. callosa* because of the size of the spores (9-) 10.5-13 (-14.2) × (5.5-) 6-7 (-8) µm and the convex to subumbonate, non-papillate pileus. *P. callosa* is an intermediate species between *P. pelliculosa* and *P. semilanceata* in spore size and the form of the pileus. However Singer's report (1969) of *P. callosa* from Chile belongs to *P. semilanceata* for the large spores and papillate pileus. *P. semilanceata* var. *caerulescens* reported by Möller (1945) conforms to the typical variety of *P. semilanceata*. Möller described a fungus acutely papillate, with spores 11-14 (-16) µm long.

Reports of *P. callosa* from Europe, besides Huijsman's record, and those considered in the synonymy, as well as those previously discussed, are those of Gillet

(1874-1893), Smith (1908), Ricken (1915-1920), Rea (1922), Heim (1957d) and Pegler (1966b). It is interesting to note that the only *Psilocybe* reported by Kalchbrenner (1878) from Siberia is *P. callosa*.

P. callosa is a hallucinogenic fungus use as a recreational drug in the Northwestern North America. Leung *et al.* (1965) reported psilocybin in this fungus (as *P. strictipes* Sing. & Smith).

The name of the species refers to the thick or hardened skin, probably referring to the somewhat cartilaginous pileus and stipe when dry.

SELECTED ILLUSTRATIONS. Huijsman (1961, fig. 1-4). Cooke (1881-1891, Plate 573, No. 605). Laplanche (1894) cited the figures: Buxbaum (t.15, f.1) and Persoon (Myc. Eur. III, t. 27, f. 3).

134. *Psilocybe carbonaria* Sing. in Singer & Moser, *Mycopath. & Mycol. Appl.* 26: 166, 1965. Figs. 605-607

Pileus 7-12 mm in diam., convex to campanulate or umbonate with an obtuse papilla, glabrous, even, viscid, hygrophanous, chestnut brown with margin grayish olivaceous, fading to yellowish brown.

Lamellae adnate, grayish to purplish gray or violaceous brown, with whitish edges.

Stipe 20-42 × 2-2.5 mm, equal, whitish at the apex to brownish at the base, but pallid ochraceous at the center, fibrillose to squarrose at the base, but apex pruinose; with white floccose mycelium at the base.

Veil cortinate poorly developed, not forming any annulus.

Context white in pileus, pale brownish in the stipe. Taste farinaceous, odor not recorded.

Spores (10.4-) 12-13 (-14.5) × 6.6-8.8 µm, ellipsoid both in face and side view, yellowish brown, thick (1 µm thick) and with a broad apical germ pore.

Basidia 18-23 × 9.5-10.5 µm, 4-spored, rarely 2-spored, hyaline, ventricose.

Pleurocystidia absent.

Cheilocystidia 23-30 × 4.8-6.8 µm, abundant, forming a sterile band, hyaline, fusoid-ventricose or sublageniform with more or less long neck 1-1.5 µm broad; some being - subpedicellate.

Subhymenium seemingly subcellular with short globose elements, hyaline or brownish, with incrustated pigment on the walls. Trama regular, hyaline or brownish. Epicutis formed by a thin hyaline subgelatinous layer, with parallel elongated to somewhat subglobose hyaline or brownish hyphae, somewhat incrustated on the walls. Clamp connections present.

HABITAT AND DISTRIBUTION. Scattered on carbonaceous soil with mosses in a forest. Known only from the type locality at 550 m elevation. Fruiting in March.

STUDIED MATERIAL. CHILE, Valdivia, Cordillera Pelada, *Singer M-3267* (Type BAFC; Isotype MICH).

DISCUSSION. *P. carbonaria* is close to *P. semilanceata* (Fr. ex Secr.) Kumm. A small difference in size of the spores as well as in the not papillate pileus seems to distinguish them. It is likely that *P. carbonaria* is a variation of *P. semilanceata*. Singer (in Singer & Moser, 1965) relates this species to *P. paupera* Sing., but the conspicuous pleurocystidia in that species strongly separates it from *P. carbonaria*. Singer (1969) refers to this species on pag. 169 instead of pag. 166 in the original description (Singer & Moser, 1965) (on pag. 169 is the description of *Pholiota carbonaria* (Fr.) Sing. which is completely independent of *Psilocybe carbonaria* Sing.).

The name of the species refers to the carbonaceous habitat.

135. ***Psilocybe cyanofibrillosa*** Guzmán & Stamets in Stamets *et al.*: *Mycotaxon* 11: 477. 1980. Fig. 766.

Pileus 14-35 mm in diam., conic to broadly convex, and eventually plane in age, glabrous, even, hygrophanous, deep chestnut brown, fading to pale tan or light yellowish brown to somewhat whitish, viscid when moist from a separable gelatinous pellicle.

Lamellae adnate or adnexed to shortly subdecurrent, light grayish when young to purplish brown with age, moderately broad and with pallid edges.

Stipe 30-70 × 2-4 mm, flexuous or straight, sometimes curved at the base, equal or enlarged downwards, longitudinally striate, fibrous, hollow to stuffed with a yellowish pith, surface light tan to yellowish brown, covered with fine light grayish fibrils that soon turn bluish in age or when touched.

Veil copious at first, whitish and cortinate, leaving fibrillose remnants especially on the upper parts of the stipe, but not forming an annulus.

Context brownish in pileus and stipe, mildly bluish when bruised. Taste more or less farinaceous.

Spores (9-) 9.5-11 (-12) × (5.5-) 6-6.6 (-7.1) μm , subellipsoid, both face and side view, pale or more or less dark chocolate brown, thick wall, with a distinct apical germ pore.

Basidia 22-28 × 6-9.5 μm , 4-spored or sometimes 2-spored, with sterigmata up to 5 μm long, hyaline, ventricose or subpyriform, frequently with a median constriction.

Pleurocystidia absent.

Cheilocystidia 22-33 × 5.5-7 μm , abundant, forming a sterile band, hyaline, fusiform to lanceolate, sometimes subpedicellate, with an elongated neck 1-1.5 μm broad.

Subhymenium more or less subcellular, with short and globose hyaline elements

mixed with hyaline hyphae, sometimes irregularly incrusting on the walls. Trama regular, hyaline, with not incrusting hyphae. Epicutis formed by a thick gelatinous hyaline layer, with more or less parallel narrow hyphae, no more than 4 μm in diameter. Hypodermium hyaline, with parallel filamentous hyphae to subglobose elements up to 20 μm wide, sometimes irregularly incrusting with reddish brown pigment. Lactiferous hyphae 5-10 μm broad, commonly colored chocolate brown or pallid yellowish in the hypodermium are present. Clamp connections present, but not common.

HABITAT AND DISTRIBUTION. Growing in large colonies, caespitose or subcaespitose, sometimes scattered in small groups, in decayed urea-enriched fir sawdust during fall. Known only from the State of Washington (U.S.A.).

MATERIAL STUDIED. U.S.A., State Washington, South King Country, *Stamets 79-8* (Type ENCB; Isotype NY); 79-15; 79-20; *Whitcher s.n.* (all in ENCB).

DISCUSSION. This species is somewhat resembling to *P. baeocystis* for the color and form of the carpophore, but differs in the form of the spores (asymmetrical or mango in that species). It is also close to *P. cyanescens* but distinguished in the absence of pleurocystidia. *P. cyanofibrillosa* is related to *P. pelliculosa*, however, the tendency of the pileus to expanded or plane, the more fibrillose and bluing stipe, the dark color of the spores, and the incrusting reddish brown pigmented hypodermium distinguish both species. It is also close to *P. caerulipes* but the spores (size and color) separate both fungi, as well as the habitat and distribution.

P. cyanofibrillosa is an hallucinogenic mushroom. Both psilocybin and psilocin were detected (0.05 mg psilocybin per gram dry weight and 1.4 mg per gram psilocin) by Beug and Bigwood (in Stamets *et al.*, 1980).

The name of the species refers to the fibrils on the stem soon becoming bluish in age, or when injured.

136. ***Psilocybe fimetaria*** (Orton) Watling *Lloydia* 30: 150, 1967. Figs. 608-614 & 759

Stropharia fimetaria Orton, *Not. Roy. Bot. Gard. Edinb.* 26: 59, 1964.
Psilocybe caesiannulata Sing., *Mycopath. & Mycol. Appl.* 26: 165, 1965.
P. fimetaria (Orton) Sing., *Agaricales modern taxo.*, p. 540, 1975.

Pileus (5-) 10-25 (-36) mm in diam., conic to convex or subcampanulate to umbonate, slightly papillate or acutely umbonate, then expanded, glabrous, but a first with conspicuous appressed silky white fibrils from the veil, surface even but slightly striate at the margin mainly when moist, viscid, with a rather tough separable pellicle, hygrophanous, pale reddish brown to honey color, sepia or ochraceous, sometimes clay olive honey, or yellowish olive, drying to ochraceous-buff or yellowish from center outwards.

Lamellae adnate, sometimes with a slight tooth at the stipe, whitish clay or pale clay-buff to olivaceous buff, finally dark purplish brown, concolorous or usually with whitish edges.

Stipe (20-) 40-65 (-90) × (0.5-) 1-3 (-4) mm, equal or slightly subbulbous, often with a slightly swollen base, stuffed with white pith, then hollow; surface white, then brownish red, pale sepia or sepia-honey especially in the lower part, sometimes with gray blue-greenish tinges at base, covered at first by a silky-fibrillose white coating from the veil.

Veil well developed as a white cortina that forms a more or less membranous and permanent annulus, but sometimes remaining only as floccose fibrils on the stipe, white or concolorous with the gills from the spore deposit.

Context whitish to ochraceous in the pileus, olive-honey under the gills, white or whitish in the stipe, soon dark Vandyke in lower part of stem; this color spreading upwards with age. Taste and odor farinaceous, especially in young stages or when cut. Bluing when injured.

Spore print dark violaceous brown.

Spores (9.5) 11-14 (-16) × 6.5-8.5 (-9.5) μm, subellipsoid or ellipsoid both in face and side view, thick-walled (1-1.5 μm), yellowish brown, with a broad germ pore.

Basidia 28-34 × 8-11 μm, 4-spored, rarely 2-spored, hyaline, subpyriform-ventricose, with sterigmata 2-3 μm wide at base.

Pleurocystidia absent.

Cheilocystidia 20-32 × 4-8 μm, abundant, forming a sterile band, hyaline, thin walled, ventricose-fusiform or lageniform (or almost Urtica-hair shape), with a narrow or pedicellate base; neck flexuous and long 4-15 × 0.5-1.5 μm, sometimes irregularly branched.

Subhymenium somewhat subcellular with globose and short elements, hyaline or brownish pale, not incrusting. Trama regular, hyaline. Epicutis formed by a thick hyaline layer with gelatinous, parallel hyphae, 1-3 μm broad. - Hypodermium hyaline to brownish, not cellular, but with elongated to subglobose elements, moderately incrusting. Clamp connections present, 4-14 μm in diam., frequently branched.

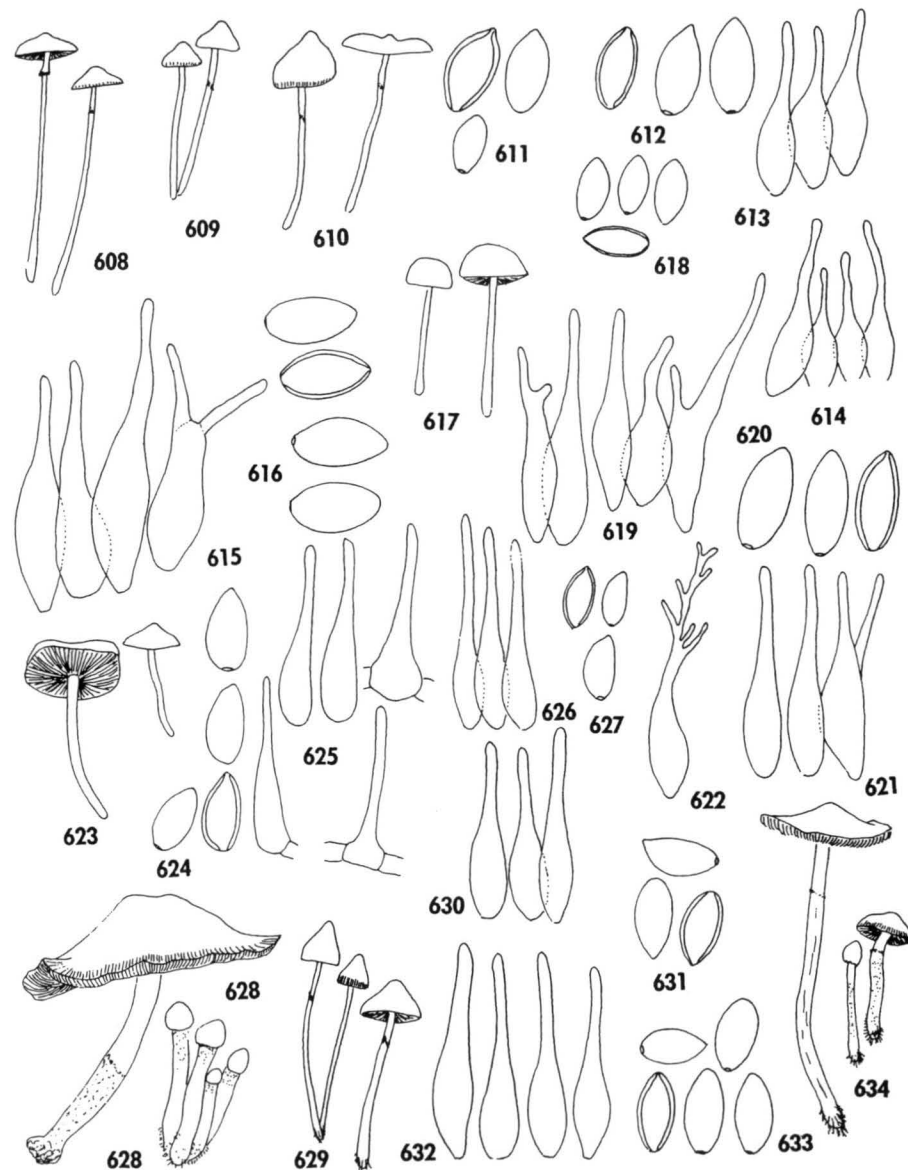


Plate 40: Figs. 608-634. - Several species of *Psilocybe*. 608-614: *P. fimetaria*, 608-610: Carpophores, 611-612: Spores, 613-614: Cheilocystidia (608, 611 & 614: type; 609: Watling 7758; 610, 612 & 614 type of *P. caesiaannulata*). 615-617: *P. liniformans*, 615: Cheilocystidia, 616: Spores, 617: Carpophores (all from the type). 618-619: *P. pelliculosa*, 618: Spores, 619: Cheilocystidia (all from the type). 620-622: *P. semilanceata*, 620: Spores, 621-622: Cheilocystidia (620 & 621: Guzmán 16618; 622: Darimont 855). 623-625: *P. serbica*, 623: Carpophores, 624: Spores, 625: Cheilocystidia (all from the type). 626-627: *P. silvatica*, 626: Cheilocystidia, 627: Spores (all from the type). 628-634: *P. venenata*, 628-629: Carpophores, 630: Cheilocystidia, 631: Spores, 632: Cheilocystidia, 633: Spores, 634: Carpophores (628: Nagasawa 4; 629 & 632-633: type; 630-631: type of *P. fasciata*; 634: Nagasawa 5).

HABITAT AND DISTRIBUTION. Singly or gregarious on dung (horse) or in rich soil, in grassland or among juncaceous plants. Sometimes forming large rings in the grass. Known from Europe, Northwestern North America, and South America (Chile). Fruiting during the summer in the boreal regions, and during the spring in the austral regions.

STUDIED MATERIAL. CANADA, British Columbia, Vancouver, *Guzmán 16631* (ENCB). New Brunswick, Kouchibouguac Natl. Park, *Redhead 2770* (DAOM 170977; ENCB); *2769* (DAOM 169937; ENCB).

U.S.A., Idaho, Shoshone, *Watling 3383* (E). Washington, Pierce, Tenino, *Benedict s.n.* (Sept. 5, 1968) (WTU 15158). Jefferson, Hoh River, *Leslie 1843* (ENCB). Near Yelm, *Stuntz s.n.* (WTU 6454).

CHILE, Valdivia, Western Cordillera Pelada, near Rio Hueycolla, *Singer M-3248* (Type of *P. caesioannulata*, BAFC; Isotype MICH).

CZECHOSLOVAKIA, Mahren, Brünn, *Hruby s.n.* (X-1927) (BP as *Stropharia luteonitens*).

DENMARK, Husby Klit, *Lange s.n.* (12-10-69 A & B) (C as *P. serbica*).

GREAT BRITAIN, Scotland, Perthshire, Rannoch Dall Wood, *Orton 2305* (11-X-1960) (E Isotype); *Orton 1331-C*, *2200*; *2681*; *2682*; *2860*; *3084*; *3085* & *3409* (all in E); *Watling 1962-C* (E). Holland, *Orton 3769* (E). Mull, *Watling 7758* (E). Whitley wood, New Forest, *Orton 4213* (E).

FINLAND, without locality, *Tuomiskosky s.n.* (Sept. 28, 1975) (H as *P. semilanceata*).

DISCUSSION. *P. fimetaria* is very close to *P. semilanceata* (Fr. ex Secr.) Kumm. and to *P. callosa* (Fr. ex Fr.) Quél. from which it differs in the annulus and non-papillate pileus with the first case, and in the size of the spores in the second case, in addition to the coprophilous habitat. It is possible to find intermediate forms between these species which are difficult to understand, at least in herbarium collections. All the "*P. semilanceata*" found in herbarium with non papillate pileus, coprophilous or subcoprophilous habitat, and annulus or subannulus are considered here as *P. fimetaria*. On the other hand, *P. subfimetaria* Guzmán & Smith is a closely related species having smaller spores (see key).

The synonymy with *P. caesioannulata* Sing. from Chile is first established here, based on a study of Singer's type (at BAFC) which agrees well Orton's type (at E). Singer (in Singer & Moser, 1965) described this fungus from Chile. Singer (1975) considered *P. caesioannulata* in the Section *Caerulescentes* Sing. Watling (1967) noted that *P. fimetaria* shows a bluing reaction, though it can be variable. Undoubtedly *P. fimetaria* is an hallucinogenic fungus. Benedict *et al.* (1967) found psilocybin, but not psilocin.

The records of *P. fimetaria* from the U.S.A. and Canada, and those from Europe, except for Great Britain are new for this fungus.

The name of the species refers to the fimicolous or subfimicolous habitat.

137. *Psilocybe liniformans* Guzmán & Bas *Persoonia* 9: 233, 1977. var. *liniformans*
Figs. 615-617

Pileus 10-25 mm in diam., convex to nearly plane, not papillate, sometimes slightly umbonate, glabrous, even, viscid, with a removable pellicle, without veil remnants, hygrophanous, dull greyish ochraceous brown with slight olivaceous tones, more reddish at center, drying to ochraceous buff with a more brownish buff center and slightly greyish-olivaceous buff margin; in young specimens with a slightly bluish-olivaceous tinge at margin.

Lamellae adnexed, rather distant, broad, ventricose fairly dark color when young to purple brown with age; the edges with a gelatinous pallid and thickish thread, removable with needle as an elastic strip.

Stipe 14-30 × 1-2 mm equal, cylindrical, with up to 4 mm broad subbulbous base, hollow, surface whitish to very pale brownish and with a pale apex, with greenish blue tinges at base, finally greyish-green blue up to the apex, pruinose-granulose above, concolorously fibrillose below.

Veil not developed or at least not evident in the adult.

Context glassy, dull brown, later pallid in stem, with amber brown layer under the surface of pileus and a nearly white context in the stipe. Smell peculiar, strongly aromatic with a foetid component when crushed to farinaceous. Taste weak, not unpleasant to somewhat farinaceous.

Spores (12-) 13-14.5 (-16.5) × 7.5-8.8 (-10) μm, ellipsoid both in side and face view, or slightly inequilateral in side view, with thick yellowish brown walls and a distinct apical germ pore.

Basidia 20-35 × 6-10 μm, 4-spored, hyaline, ventricose-subcylindrical, often with slight median constriction.

Pleurocystidia absent.

Cheilocystidia 22-33 × 5.5-9 μm, abundant, combined with underlying gelatinized hyphae to form a sterile, detachable, elastic thread like band, hyaline, lageniform, with a neck more than 6 μm long and 1.5-2.5 μm wide, often forked, sometimes with an hyaline, apical viscous drop dissolvable in KOH.

Subhymenium subcellular, subhyaline, with yellow-brown pigment irregularly scattered amongst the cells. Trama regular, hyaline to brownish made up of hyphae with elongated cells, without incrusting pigment. Epicutis as gelatinized, thin layer, consisting of embedded, parallel, thin 1.5-3.3 μm wide, hyaline hyphae. Hypodermium formed by hyaline, up to 15 μm wide globose to elongated cells. Clamp connections present.

HABITAT AND DISTRIBUTION. Scattered or gregarious on horse dung or rich soil in meadows. Known only from the Netherlands (type locality). Fruiting from summer to autumn.

STUDIED MATERIAL. HOLLAND, Prov. Zealand, Island of Schouwen, Haamstede, Duinhoeve, *Bas* 5512 (Type L, Isotype ENCB).

DISCUSSION. *P. liniformans* var. *liniformans* is distinguished from the others of the Section for the gelatinized edges of the gill. It is somewhat close to *P. fimetaria* (Orton) Watling, *P. serbica* Moser & Horak and *P. cyanescens* Wakef., but differs in the well developed veil, forming a cortinate ring-zone on the stem and spores measuring in *P. fimetaria*, which also grows on dung. From *P. cyanescens* for the form of the cheilocystidia and the habitat, and from *P. serbica* in the cheilocystidia and spores. *P. callosa* (Fr. ex Fr.) Quél is also a related species but has small spores, and more umbonate or papillate pileus.

P. liniformans var. *liniformans* is very probably an hallucinogenic fungus, because of the strong relationships it has with the above mentioned hallucinogenic species, as well as for the bluing feature, and the farinaceous taste and flavor.

The name of the species refers to the edge of the gill, a thread-like band, which is removable as an elastic strip.

SELECTED ILLUSTRATIONS. Guzmán & Bas. (1977, figs. 1-10).

138. *Psilocybe liniformans* var. *americana* Guzmán & Stamets in Stamets *et al.*, *Mycotaxon* 11: 480, 1980.

This fungus is very close to the type variety, but differs in the absence of the gelatinous layer on the edge of the lamellae, as well as in the terricolous habitat. The other macroscopic features as well as the microscopic ones, agree well with the type variety, even the bluing reaction.

HABITAT AND DISTRIBUTION. Scattered on soil in fields. Known only in North America (Michigan, U.S.A.) and South America (Chile). Fruiting in summer to autumn, and early winter in North America, and in spring in South America.

STUDIED MATERIAL. U.S.A., Michigan, Cheyboygan, *Smith* 35963 (MICH). Washington State, Thurston County, Olympia, *Stamets* 79-12 (Type ENCB; Isotype NY). Oregon, Corvallis, *Morgan* s.n. (Nov. 1979) (ENCB; NY). CHILE, Prov. Valdivia, 5 km North of Los Conales, *Singer* M-6901 (SGO as *P. callosa*).

DISCUSSION. As the type variety this fungus is hallucinogenic. According to Beug and Bigwood (in Stamets *et al.*, 1980) it contains psilocybin, but not psilocin. The type collection contains 5.9 mg per gram dry weight and the other collections contain average 8.9 mg per gram.

This variety is close to *P. callosa* and *P. semilanceata*, but differs from the former in the size of the spores and cheilocystidia, and from the later in its non-umbonate pileus and its wide spores. The record from South America is new for this fungus and refers to *P. callosa* reported by Singer (1969) from Chile. Singer's specimen agrees well with the type of *P. liniformans* var. *americana*. Singer wrote about his

fungus: "This collection is referred to *P. callosa* with some doubt. The larger and not lilaceous-violet (in water) spores, the color of the pileus, its size and the more gelatinized epicutis seem to show that this is not identical with the species called *P. callosa* by Huijsman". "Since Quélet finds the spores to be 12-15 μ m long., i.e. close to our measurements, we believe that there is a possibility that our form exist in Europe also, and may have been the one originally described by Fries". Quélet's fungus according to Singer's observations is probably *P. liniformans* var. *liniformans* that is only known in Europe.

SELECTED ILLUSTRATIONS. Stamets *et al.* (1980, figs. 2-5).

139. *Psilocybe pelliculosa* (Smith) Sing. & Smith *Mycologia* 50: 280, 1958.
Figs. 618-619, 643-649, 698, 764-765, 767 and Plate 2

Psathyra pelliculosa Smith, *Mycologia* 29: 58, 1937.

Pileus (5-) 10-15 (-30) mm in diam., obtusely conic to convex or conic-campanulate or subumbonate, sometimes slightly papillate, frequently with a straight margin, remaining so, never fully expanding, viscid, with a separable gelatinous pellicle, glabrous or irregularly covered at first with white floccose, scales from the veil, even, but the margin translucent striate when moist, and with white small appendages from the veil only in young stages, surface hygrophanous, reddish brown or brownish orange, fading to pale dull alutaceous or pale yellowish brown, sometimes whitish to yellowish or cream color, often with greenish blue tints in age.

Lamellae adnate to adnexed, eventually separating from the stipe, close, whitish when young to cinnamon brown or violaceous brown, with whitish edges.

Stipe (20-) 40-50 (-100) $\times$ (1-) 1.5-2.5 (-4) mm, equal or with enlarged or subbulbose base, frequently with adhering remnants of mycelium, stuffed with white floccose mycelium, to hollow, straight or more frequently flexuous, surface whitish to yellowish or grayish brownish or pale reddish brown, mottled or covered by appressed white silky fibrils from the veil, becoming bister in age, pruinose above.

Veil well formed as a white arachnoid coating in young stages, but not forming an annulus in the adults, soon evanescent except for the fibrils or scales on both pileus and stipe.

Context whitish, thin and pliant in pileus, somewhat tough and reddish brown in the stipe. Bluing slightly both in pileus and stipe when cut. Odor and taste farinaceous, mainly in young and fresh specimens. KOH stains pileus and context pale to dark yellowish reddish brown. Stipe not reaction or only slightly so.

Spore print purplish brown or dark violaceous brown.

Spores (8.2-) 9.3-11 (-12) (-13) $\times$ 5-6 μ m, ellipsoid or subovoid both in side and face view, yellowish brown, moderately thick walled (0.5 μ m), with a broad apical germ pore (readily observable through the electron microscope) (see figures).

Basidia 22-35 × 7-10 μm, 4-spored, hyaline, ventricose or subpyriform, frequently with a median constriction.

Pleurocystidia absent.

Cheilocystidia (17-) 20-36 × (3.8-) 4.4-6.6 (-7.5) μm, abundant, forming a sterile band, hyaline, fusiform-lanceolate or fusiform-ventricose, often pedicellate, and with an elongated neck 1.5-2 μm broad, tapering to an acute or subacute apex; sometimes irregularly branched. Frequently with an hyaline viscous drop at the apex (these seem solid and verrucose by the electron microscopy; see figure).

Subhymenium narrow and irregular, more or less subcellular with short globose elements, brownish with some incrusting pigment, not so conspicuous. Trama regular, pale brownish to hyaline, with thin walled hyphae. Epicutis formed by a thick gelatinous pellicle, of more or less horizontal very loosely arranged hyaline hyphae, 1-2 μm in diameter, not incrusting. Hypodermium formed by elongated to subglobose hyphae, 5.5-14 μm in diameter, hyaline or brownish, walls not incrusting. Clamp connections common.

HABITAT AND DISTRIBUTION. Scattered to gregarious or caespitose on humus (composed of different kinds of debris), in trails or clearing of conifer forests, predominantly along the forest edge; sometimes on bark mulch beds or different debris in gardens below shrubs. Uncommon in grasslands. Known from western North America and northern Europe.

STUDIED MATERIAL. CANADA, British Columbia, Vancouver, *Leslie 3827* (ENCB).

U.S.A., California, Eureka to Arcata, Humboldt Co., *Comes & Belt* s.n. (nov. 1, 1979) (ENCB). Crescent City, *Smith 8260* (MICH). Orick State Park, *Smith 9370* (MICH). Idaho, Lewis, Green Horn Creek, *Tylutki 4085* (ENCB). Coeur d'Alene Nat. Forest Park, *Scates KS-2465* (ENCB). Kelley, *Smith 73589* (MICH). Shoshone, *Watling 3377* (E). Granit Creek, Nordman, *Smith 54268* (MICH). Bonne, Bararch, *Watling 3749* (E). Michigan, Tahquamenon Nat. Park, *Smith 40464* (MICH). Oregon Watershed, Rock-Creek, near Corvallis, *Rhoades 53; 114; 12-15-70; 11-19-70; 11-13-70; 11-75* (all in OSU). Sitcoos Station, *Guzmán 16654* (ENCB). Lane, *Leslie 3942 & 4023* (ENCB). Near Lake Tahkenitch, *Smith 3431* (Type MICH; Isotype ENCB). Washington, near Olympia, *Guzmán 16597* (ENCB). Lewis, Cispus River, *Smith 83425* (MICH, as *P. silvatica*). Seattle, *Allen* s.n. (10-25-77) (ENCB); *Guzmán 16602* (ENCB; NY); *Stuntz 12253* (WTU). Lake Keechelus, *Stuntz* s.n. (Sept. 27, 1969) (WTU). Seattle, *Stuntz 12194; Stuntz*, s.n. (Nov. 11, 1944 & Oct. 20, 1945) (WTU). Near Tacoma, *Stamets 78-29* (ENCB). Olympia, *Leslie 3827; 3842; 3844 & 3847* (ENCB). Evergreen State College Campus, *Gerrish* s.n. (Nov. 75) (MICH); *Ott 75-5* (ENCB); *Bigwood 03, 03-A & 010* (ENCB); *Boydston 01* (ENCB); *Stamets 77-22* (ENCB). Mt. Rainer Nat. Park, St. Andrew's Creek, *Stuntz* s.n. (Oct. 19, 1952) (WTU); *Smith 40212* (MICH). Western Tenino, Offut Lake, *Stamets 77-23* (ENCB). Near Millersylvania State Park, Maytown, *Leslie 2758* (ENCB); *Ott et al. 75-7* (ENCB). Pierce, *Marckx* s.n. (Oct. 5, 1956) (WTU). Snohomish, Lee Forest, *Stuntz 13215* (WTU). Near Cispus, *Stamets*, s.n. (Oct. 1977) (ENCB); *Guzmán 16900* (ENCB); *16903* (ENCB; NY). Cultus Bay Road, Whidbey Island,

Stuntz s.n. (Nov. 5, 1967) (WTU). Little Rock, *Ott 11-74* (ENCB). San Juan Islands, South of Vancouver, Orcas Island, Mt. Constitution, *Stamets 80-89* (ENCB). FINLAND, Helsinki, Vantaa, *Tuomikoski* s.n. (Oct. 7, 1951) (H as *Galerina sideroides*).

DISCUSSION. This species is very close to *P. silvatica* (Peck) Sing. & Smith, which has smaller spores (see key), and grows mainly inside of the forests. It is probable that these two species have a wider distribution and only when this is known, it will be possible to understand the geographical distribution in relation to the size of the spores. Guzmán (1979a) noted that in Mexico the tropical species have smaller spores, e.g., in *P. uxpanapensis* Guzmán and others, but the boreal species from the high mountains have relatively larger spores, e.g., in *P. aztecorum* Heim emend. Guzmán, and the subtropical or intermediate species have spores of intermediate size, e.g., in *P. mexicana* Heim. It is probable that *P. silvatica* and *P. pelliculosa* represent a phylogenetic line, from small to large spores.

P. pelliculosa was first considered as *Psathyra* by Smith (1937), but then he thought that it was a synonym of *Hypholoma silvatica* Peck (Smith, 1941a). Finally, Singer & Smith (1958b) considered it as *Psilocybe pelliculosa*. A good illustration of *P. pelliculosa* was published by Smith (1941, pl. 10, fig. 1, as *Hypholoma silvaticum*), but this figure more closely agrees with *P. silvatica*, because Smith (l.c.) reported spores 7-9 (-10) × 4.5-5.5 μm, which are the size of that species.

P. semilanceata var. *microspora* Sing., described from Chile (Singer 1969) and initially considered by Guzmán & Ott (1976) as synonym with *P. pelliculosa*, is now better considered as a synonym of *P. callosa* (Fr. ex Fr.) Quél. as was discussed above. *P. pelliculosa* is very close to *P. semilanceata* (Fr. ex Secr. Kumm.), but differs in the size of the spores, which are larger in that species and for the more papillate pileus. Those collections of *P. pelliculosa* reported by Singer & Smith (1958b) with spores 10.5-13 (-14) perhaps belong to *P. semilanceata*.

Specimens from Seattle, Washington: *Allen* s.n. (10-25-77) and from Tenino: *Stamets 77-23*, were considered tentatively represent a new variety because of their strongly hygrophanous almost white when fading and more convex than conic pileus, but they grow in gardens on bark mulch, among ivy or rhododendron and are frequently sterile. It is probable that this is an ecological variety, but more studies are necessary in order to define this possibly new taxon. The record from Finland reported here is the first report of *P. pelliculosa* in Europe; the material, *Tuomikoski* s.n. (Oct. 7, 1951), agrees well with the type of *P. pelliculosa*.

P. pelliculosa is an hallucinogenic fungus widespread in Northwestern North America and used as recreation drug. Tyler (1961) reported psilocybin. Smith (1975), Ott (1976), Duffy & Vergeer (1977), Menser (1977), Stamets (1978), and Ott and Bigwood (1978) reported this species from that region.

The name of the species refers to the removable gelatinous pellicle of the pileus.

SELECTED ILLUSTRATIONS. Menser (1977, fig. 21); Ott (1976, pl. 2); Ott & Bigwood (1978, fig. 9); Smith (1975, fig. 166); Stamets (1978, fig. 21).

140. *Psilocybe semilanceata* (Fr. ex Secr.) Kumm. *Führ. Pilzk.*, p. 71, 1871.
Figs. 620-622, 701 & 762

Agaricus semilanceatus Fr. *Epicr.*, p. 231, 1838.
Geophila semilanceata (Fr.) Quél., *Enchir. Fung.*, p. 115, 1886.
Panaeolus semilanceatus (Fr.) J.E. Lange, *Fl. Agar. Dan.* 4, p. 84, 1939.
(non *Psilocybe semilanceata* var. *caerulescens* (Cke.) Sacc.; see *P. callosa* (Fr.) Quél.).

Pileus (0.5-) 10-20 (-25) (-40!) in diam., 0.5-2.5 mm high, frequently semi-spear shaped, first conic to obtusely conic or sharply conic, sometimes campanulate or umbonate or more frequently with a distinct and tall papilla, remaining so or sometimes becoming subexpanded, but acute papillate, glabrous, but in young stages with the margin covered by white fibrils rest from the veil, even but translucent striate when moist, opaque when faded, viscid, with a removable gelatinous pellicle (only in fresh condition), hygrophanous, reddish brown at first to grayish brown, fading to pale ochraceous or yellowish brown or clay color, sometimes tinge of olive or greenish.

Lamellae adnate or adnexed, pale grayish violaceous to dark violaceous brown, concolorous or somewhat mottled, and with whitish somewhat fimbriate edges.

Stipe (40-) 50-113 (-119) $\times$ 1-2 (-3) mm, equal or somewhat subbulbous, sometimes fistulose, hollow but at first solid to stuffed with a white pith, smooth but pruinose at the apex, or slightly covered by fibrils but glabrescent when mature, fibrillose, cartilaginous and pliant, white or whitish to yellowish, but reddish brown downwards to concolorous with the pileus, frequently staining blue or greenish blue at the base.

Veil arachnoid or cortinate, white and conspicuous in young stages, but soon evanescent, not forming an annulus in the mature stages.

Context very thin, pliant, whitish to concolorous with the surface in the pileus, yellowish and somewhat pliant in the stipe; slightly bluing. Taste and odor slightly farinaceous. KOH stains the pileus and the context reddish brown, but it is negative on the stipe.

Spore print dark violet brown or brown purplish darker.

Spores (11-) 12-14 (-16) (-18!) $\times$ (6-) 7-8 (-9) $\times$ 4.8-5.4 μ m, subellipsoid or ellipsoid both in face and side view, sometimes slightly lemon-shaped, pale yellowish brown with thick wall (up to 0.5 μ m), and with a distinct and broad germ pore up to 1.5 μ m wide.

Basidia 22-33 $\times$ 8-9.6 μ m, 4-spored, rarely 2-spored, hyaline, ventricose or subclavate, with a slight median constriction. Sterigmata 2.4-3.6 μ m long.

Pleurocystidia absent or scarce, when present, similar to cheilocystidia.

Cheilocystidia 18-32 (-35) $\times$ (4.5-) 5-8 μ m, abundant, forming a sterile band, hyaline, thin-walled, lageniform or bottle shaped with a central or somewhat eccentric, elongate and flexuous neck, (1.5-) 2-3 μ m diam., frequently irregularly bifurcate or strong branched (mostly in older specimens). Sometimes with a very hyaline subgelatinous viscous drop at the apex, up to 60 μ m diam. (!).

Subhymenium hyaline, formed by more or less elongated thin walled, non-incrusted hyphae. Trama regular, with parallel arranged to somewhat interwoven, greatly elongated hyphae, 10-20 μ m broad, hyaline or dark yellowish brown. Epicutis formed by a well developed gelatinized pellicle, consisting of parallel hyphae 1-2 (-4) μ m broad, somewhat incrusted on the walls. Hypodermium formed by elongated to globose sordid yellowish thin walled elements, 5-15 μ m wide. Lactiferous or vermuculose hyaline or yellowish hyphae, 3-5 μ m broad are present everywhere. Clamp connections very common.

HABITAT AND DISTRIBUTION. Very scattered to gregarious on rich soil, among grass in fields near farmyards, in well-manured pastures or meadows, rarely along roadsides. Single but very rarely caespitose. Frequently abundant around clumps of tall grasses. Fruiting August-November, rare in June-July, frequently in October-November, sometimes in December when the weather is favorable. The material from Australasia was collected in May. Known in temperate regions to the subalpine regions, both in boreal and austral continents. It is known from many countries of Europe (type locality "ad vias, inter gramina stercoreata": Fries, 1836-1838, p. 178), Canada, U.S.A., Chile and Australia and Tasmania. Pegler (1966) wrote "very common, occurring in large troops in cut grass, throughout the autumn". It is unknown in Mexico. Two collections from Brazil, identified by Rick as *P. semilanceata* (Rick 257 at BPI and Rick 9327 at PACA 14558) actually belong to *Naematoloma* group *ericaceum*. Saccardo (1887) reported *P. semilanceata* from Southern Africa, but this report was not checked by the author.

STUDIED MATERIAL. CANADA, British Columbia, Victoria, *Paden* s.n. (Oct. 25, 1973) (ENCB). Vancouver, Campus UBC, *Bandoni* 3500 (MICH). Barstow Island, *Pollock* 10-20-75 (ENCB). Crofton, *Reimer* s.n. (Nov. 16, 1974) (ENCB). Crofton, Near Duncan, *McLaughlin* 1 (ENCB).

U.S.A., New York, Albany, *Peck* s.n. (NYS as *Psilocybe foeniculii*). Oregon, Coast Range, Andrew Exp. Forest, *Beaver & Rhodes* 188-B (ORE). Near Wilsonville, *Jacobs* s.n. (Dec. 1976) (ENCB). Lincoln, Siletz, *Weil* s.n. (Nov. 1974) (ENCB). Lane, *Rhoades* s.n. (11-17-75) (OSU); Florence, *Leslie* 3766; 3930; 3906 & 3928 (ENCB). Currey, near Sixes, *Leslie* 2781 (ENCB). Near Siltcoos Station, *Guzmán* 16669 (ENCB); *Menser* 880 (ENCB). Near Corvallis, *Rhodes* 191-B (ORE). Virginia, Vermont, Middlebury, *Langlois* s.n. (Oct. 24, 1898) (BPI). Washington, Cape Flattery, *Smith* 18020 (MICH). Mt. Baker, *Haard* s.n. (10-30-75) (ENCB), Hoquiam, *Haard* 1 (ENCB). Near Tacoma, *Stamets* 78-28 (ENCB). Lewis, near Randle, *Pollock* s.n. (10-26-75) (ENCB); *Gerrish* s.n. (Nov. 1975) (ENCB); *Leslie* 2710 (ENCB). Near Olympia *Ott* 75-12 (ENCB) (This specimen was reported by *Guzmán et al.*, 1976, as *P. pelliculosa*); *Leslie* 3832 (ENCB); *Guzmán* 16608 & 16610 (ENCB). Near Bellingham, *Leslie* 3877 (ENCB); *Guzmán* 16617 (ENCB) 16618 (ENCB; NY). Mt. St. Helen, Spirit Lake, *Stuntz* 15022 (WTU). Seattle Airport, *Leslie & Repke* 4681 (ENCB). Grays Harbor, near Quinalt, *Leslie* 1351; 1807 & 2426 (ENCB; MICH). Thurston, *Leslie* 3717 & 3828 (ENCB); *Stamets* 77-27 (ENCB). Jefferson, Hoh River, *Leslie* 1843; 2409 & 2464 (ENCB & MICH). Tenino, *Bigwood* 05 (ENCB).

CHILE, Prov Valdivia, Cordillera Pelada, *Singer* M-3236 (BAFC). Prov. Valparaíso, Peñuelas, *Lazo* PE-6 (NY).

AUSTRIA, *Herpell* s.n. (Oct. 1890) (W). Tiro, *Pitztal, Stillbergalp, Horak 63/41* (ZT).

BELGIUM, Brahant, Meerdael, *Thoen 4435* (LFG). Liege, Waimes, *Laowait* (21-8-1972) (LG). Werbomont, *Lambinon* s.n. (20-X-1957) (LG). Vecquee, Seraing, *Darimont 765; 855 & 1489* (LG).

CZECHOSLOVAKIA, Chlum, Trebon, *Svrcek 369-45* (PR-703898). Montes Tatras Magnae, *Kuthan* s.n. (14-IX-70) (BRA). Tabor, *Bubak* s.n. (Oct. 25, 1905) (BPI, not checked microscopically).

DENMARK, Botoer, *Möller 1939* (C). Jyll, Borris Hede, *Ferdinandsen & Winge* s.n. (Aug. 1907) (C, not checked microscopically).

GREAT BRITAIN, Albans, Great Woods, *Reid* s.n. (5-10-1952) (MICH; K). Kew, *Murrill* s.n. (Nov. 1910) (NY).

FINLAND, Tavastia, Tammda, Mustiala, *Karsten 1564; 1566 & 1568* (H). Ostrobothnia, Vasa, *Karsten 1562* ("ex Herb. Fries") (H, UPS). Helsinki, *Tuomikoski* s.n. (Sept. 1952 & Sept. 8, 1954) (H). Koli, Pielisjarow, *Tuomikoski* s.n. (Aug. 24, 1956) (H). St. Lappi, Kaukola, Kokela, *Saltin* s.n. (Sept. 26, 1957) (H). Satakinta, Nourmarkuu, *Laurila* s.n. (Sept. 23, 1937) (H).

FRANCE. Without locality, *Bon 70453* (Bon Herb., ENCB); *Desmazieres 1863* (PC as *Panaeolus acuminatus*). Dinan, La Chenaie, *Heim 500* (PC). Pontcarre, *Romagnesi* s.n. (5-9-1943) (LIL). Somme, *Bon 711108* (Herb. Bon; ENCB); Ambpeteuse, *Bon 70493* (Herb. Bon; ENCB).

GERMANY, Without locality, *Hennings* s.n. (B). Kleiner Arbersee, Zwiesel, Baviere, *Demoulin 4386* (LG). Branderburg, Triglitz, *Jaap 829* (BP, BPI, H, L, W). HOLLAND, Nord Brahand, Eindhoven, *Arnolds 463* (L).

ITALY, Val de Sole. *Bresadola* s.n. (Sept. 1898) (NY).

NORWAY, Troms Kafjord, Mellon Djupvik, *Sivertsen 551* (O). Harstad, Grunnvannet, *Stordal 9413* (O). Nordreisa, *Stordal 9580* (O). Akershus, Nannestad, *Gulden 28-9-1969 & 911-68* (O). Lyngdal, Lene, *Foss & Vetleseter 27-9-1969* (O). Hedmark, Valer Enberget, *Furuset 27-8-1951* (O).

SWEDEN, Småland, Femsjö, *Nathorst-Windahl 5537 & 6387* (GB); *Lundell 1148* (BPI, PR, UPS); *Lundell 3964* (UPS); *Lundell & Haglund 2864 & 5027* (UPS). Almesakra, *Haglund 487* (UPS). Eksjö, *Haglund 125, 164 & 365* (UPS). Upsala, Bondjyrka, *Berlin* s.n. (Oct. 7, 1951) (UPS). Stockholm, *Romell* s.n. (Oct. 10, 1916) (C, FH, NY).

U.S.S.R., Kavelia, Viborgs, *Theseleff* s.n. (Sept. 21, 1892) (H).

AUSTRALIA. Tasmania, Mt. Field National Park, *Watling 10306* (E).

DISCUSSION. This is one of the most common hallucinogenic species of *Psilocybe* growing in meadows in Europe and in North America (Canada and U.S.A.), though its hallucinogenic properties were only recently discovered, in contrast to the early description of this species by Fries (1836-1838). Lundell in the herbarium notes of specimen 1148 of *Fungi Exsiccati Suecici* wrote: "This species is fairly common at Femsjö". It seems that the first report of *P. semilanceata* as an hallucinogenic fungus is by Heim (1963) and then by Heim (1971) and Heim *et al.* (1967). Hofmann *et al.* (1963), Benedict *et al.* (1967) and Mantle & Waight (1969) reported psilocybin from *P. semilanceata* (the material of Hofmann *et al.* and Mantle & Waight was

collected in Europe and the material of Benedict *et al.* in the U.S.A.). Repke & Leslie (1977) reported baecocystin in addition to psilocybin in material collected from Northwestern U.S.A. Høiland (1978) reported *P. semilanceata* from Norway and all his collections contain psilocybin, baecocystin, nor-baecocystin, and 4-, or, 5-hydroxytryptofan, but not traces of psilocin were found.

However, it seems that *P. semilanceata* was known as a hallucinogenic fungus in Europe before the last century. In fact a very interesting book by Sowerby published in 1803 (Sowerby, J., 1803. *Coloured figures of English fungi or mushrooms*. F.L.S., London) (Heim, 1971), showed two possibly hallucinogenic mushrooms: *Agaricus semiglobatus* and *Agaricus "glutinosus"*, of which the latter is *Psilocybe semilanceata* according to Heim. The first being *Stropharia semiglobata* (Batsch ex Fr.) Quél., a very common nonhallucinogenic fungus. Sowerby reported an intoxication of hallucinogenic type by these fungi based on information from E. Brande in Nov. 16, 1799. One man and four children ate these fungi. Heim's paper (1971) was first based on a letter written by R. Singer to R.G. Wasson discussing the Sowerby book. Heim *et al.* (1967) made cultures of *P. semilanceata* and eventually obtained small, strongly bluing carpophores in comparison to the wild type. In cultures the pileus was convex, not papillate. Semerdzieva & Musilek (1976) stated that they have cultures of *P. semilanceata*.

P. semilanceata var. *caerulescens* (Cke.) Sacc. (= *P. cookei* Sing.) is a synonym of *P. callosa* (Fr.) Quél. as was discussed.

Bon (1970) considered "var. *obtusa*" the convex not papillate forms of *P. semilanceata*, and undoubtedly Bon's variety also belongs to *P. callosa*. *P. semilanceata* is very closely related to *P. fimetaria* (Orton) Watling. It seems that the annulus and fimicolous habitat in *P. fimetaria* as well as the not so papillate pileus, are the only features that separate both species. *P. fimetaria* grows on dung or at least on rich soil and has an arachnoid annulus in the mature specimens. It contains also psilocybin and the bluing feature, but frequently the pileus is convex to conic and not papillate. The collection *Karsten 1562* "ex Herb. Fries", at UPS as *Agaricus (Psilocybe) semilanceatus*, has some specimens with an arachnoid annulus and may belong to *P. fimetaria*. The same was observed on the collection *Lundell & Haglund 5027* at UPS.

P. semilanceata was reported from Europe (over and beyond those works of Fries, Kummer, Quélet, Karsten and Saccardo which have already been cited) by: Smith (1908), Ricken (1915, 1920), Velenovsky (1920), Bresadola (1931), Lange (1939, as *Panaeolus*), Möller (1945), Kühner & Romagnesi (1953), Straus (1959), Schulman (1960), Lange & Hora (1963), Eliade (1965), Pegler (1966), Moser (1967), Orton (1969), Pegler & Young (1971), Watling & Richardson (1971), Darimont (1973), Bon (1972), Urbanas *et al.* (1974), Dennis *et al.* (1975), Bresinsky & Haas (1976), Kalamees (1978), and Jarva & Parmasto (1980). Moreover McIlvaine & Macadan (1900) reported this species from U.S.A. But Peck's (1909 & 1912) reports are doubtful because the author of this monograph, did not find any *P. semilanceata* in NYS herbarium, but a "*Psilocybe foeniculii* (Pers.) Fr." collected in Albany, N.Y. (June) was found that really is *Psilocybe semilanceata*. This is the first case of

the species in the east of U.S.A. Another specimen identified by Peck as *P. semilanceata* (Bartholomew, Nov.) is *Naematoloma* group *ericaceum*. Peck (1912) reported *P. semilanceata* from Albany in autumn as rare in pastures and rich grassy places.

Hejtmánek & Hejmanková (1976) described a method of fluorescence staining of hyphal nuclei in several fungi among which between was *P. semilanceata*. Melendez-Howell (1967) studied the spore wall and the germ pore of *P. semilanceata*. *P. semilanceata* was first considered as the type species of the genus (Singer, 1953; Singer & Smith, 1946a and Horak, 1968) (see discussion of the genus).

The name of the species means half spear-shaped, from the shape of the pileus.

SELECTED ILLUSTRATIONS. Heim *et al.* (1967, pl. IX, figs. 4-5; pl. X); Horak (1968, p. 526); Menser (1977, fig. 22); Ott (1976, pls. 24-26); Ott & Bigwood (1978, fig. 10); Stamets (1978, figs. 22-23); Watling (1973, pl. 34). Laplanche (1894) cited the figures Gillet (t. 401), and Sowerby (248, f. 1-3), beside Cooke's plates.

141. *Psilocybe serbica* Moser & Horak *Zeits. Pilzkunde* 34: 138, 1968.

Figs. 623-625 & 761

Pileus (10-) 20-30 (-35) mm in diam., convex to campanulate, becoming irregularly plane or somewhat depressed, glabrous and even, margin striate when moist, subviscid, hygrophanous, reddish brown or brownish yellow fading to grayish yellow, ochraceous or straw color when dry, staining blue when injured.

Lamellae adnate or adnexed to shortly sinuate, violet brown to chocolate-brown, sometimes with whitish edges.

Stipe (20-) 30-50 (-60) × (1.5-) 3-5 mm, cylindrical, equal or with some thickness toward the base, white to whitish or irregularly brownish, easily staining blue when touched or injured, fibrillose-pruinose mainly toward the base.

Veil as a delicate and white evanescent cortina, inconspicuous in the adult forms.

Context whitish to yellowish in the pileus, yellow-brown in the stipe. Staining blue when cut. Odor and taste farinaceous.

Spores (9-) 10-12 (-13.2) × (5.5-) 6.6-7.7 (-8.8) × 6-7 μm, elongate-ellipsoid both in face and side view, with a broad apical germ pore, with thick wall (1-1.5 μm), dark yellowish brown.

Basidia 24-38 × 6.6-8.8 (-10) μm, 2-, 4-spored, sterigmata up to 6.6 μm long, hyaline to somewhat granulose, vesiculose-subpyriform, with a slight median constriction.

Pleurocystidia absent or rare, more or less common toward the edge of the gill and similar to the cheilocystidia or more frequently mucronate, hyaline, 16-25 × 4.4-7.7 μm.

Cheilocystidia (20-) 25-36 × (6-) 7.5-8.4 (-11) μm, abundant, lageniform, hyaline, necks 1.5-2.5 (-3.3) μm broad, frequently arising from hyphae parallel to the edge of the gill.

Subhymenium subcellular, yellowish or brownish orange, with pigment irregularly incrustated on the walls of the elongated to globose hyphae, 5-9 μm diam. Trama regular, hyaline, with elongated 5-14 μm diameter hyphae. Epicutis formed by a hyaline, thin and gelatinized layer of hyphae, 2-4 μm diameter. Hypodermium hyaline, seemingly subcellular, with elongated to subglobose hyphae, up to 22 μm diameter. Upper part of the stipe with lageniform caulocystidia, 60-90 μm long. Hyphae with clamp connections present.

HABITAT AND DISTRIBUTION. Gregarious on humus or on very rotten wood mixed with soil, in *Fagus sylvatica* forests or *Fagus-Abies* forests. Known only from the Central Europe (Yugoslavia and Czechoslovakia).

STUDIED MATERIAL. CZECHOSLOVAKIA, Silherovice, *Kuthan 29-X-74* (BRA as *P. maire*); Cadca, Rakova, *Kuthan 22-X-69* (BRA as *P. maire*).

YUGOSLAVIA, Serbia, Tara, *Moser & Horak 63-727* (IB Type; Isotype ZT).

DISCUSSION. This species is a hallucinogenic fungus containing psilocybin and psilocin (Moser & Horak, 1968). It is close to *P. atrobrunnea* (Lasch) Gill., but differs in the bluing reaction and in the habitat; *P. atrobrunnea* grows on *Spagnum* bogs and does not turn blue. It is also close to *P. cyanescens* Wakef. but the form and size of the cheilocystidia, as well as the well definite pleurocystidia of that species, separate both well. The fungus deposited at C as *P. serbica* by Lange belongs to *P. fimetaria* (Orton) Watling. *P. serbica* is also close to *P. maire* Sing. but differs in the size of the cheilocystidia, as well in the distribution. Those collections reported here from Czechoslovakia were identified by Kuthan and Singer as *P. maire*. Other materials from the same country (at BRA) were also identified as *P. maire*; these actually belong to *P. atrobrunnea* (Lasch) Gill (see that species).

Moser & Horak (1968) reported spores 9-11 (-12) × 5.5-6.5 (-7) μm and cheilocystidia 25-35 (-38) × 6.5-8.5 (-9) μm though they did not mention the fact that they arise from the parallel hyphae of the subhymenium. This feature was reported by Guzmán & Bas (1977) when they discussed *P. liniformans* Guzmán & Bas and its relationships with *P. serbica*. The report of Derbsch (1976) of *P. maire* from Germany may actually be of *P. serbica*. He described cheilocystidia 20-30 × 5-6 μm. Bresinsky & Haas (1976) recorded *P. serbica* from Germany, but the author of the present monograph did not confirm this report.

Moser (1967) reported *P. serbica* and suggested *Hypholoma cyanescens* R. Maire as a possible synonym (but *H. cyanescens* is synonymous with *P. maire*). *P. atrobrunnea* reported by Høiland (1978) very probably is *P. serbica* for the size of the spores, habitat and for contains psilocybin. See discussions of *P. maire* Sing. and *P. coprinifacies* (Roll.) Pouz. (the latter is a doubtful species).

The name of the species refers to Serbia, the region of the type locality.

142. *Psilocybe silvatica* (Peck) Sing. & Smith *Mycologia* 50: 277, 1958.

Figs. 626-627

Psathyra silvatica Peck, *Ann. Rep. N. Y. State Mus.* 42: 20, 1889.

Hypholoma silvaticum (Peck) Smith, *Contrib. Univ. Mich. Herb.* 5: 21, 1941.

Pileus (5-) 8-20 (25) mm in diam. sharply to obtusely conic, usually becoming broadly campanulate to broadly conic, often with a papilla, the margin at first appressed against the stipe and for a time slightly appendiculate from the remains of the submembranous to fibrillose partial veil, glabrous at maturity, even but striatulate when moist, viscid, pellicle separable and tenacious, hygrophanous, color dull dark sordid to pale yellowish brown when fresh and moist, sometimes with a distinct grayish green tinge along the margin, fading to pale buff.

Lamellae adnate, dull cinnamon brown at first, finally dark smoky brown from the spores, edge whitish.

Stipe (30-) 69-80 × 1-2 (-3) mm, cylindrical, equal or the base slightly enlarged, hollow, rather pliant but rigid, flexuous, swollen at the base, surface appressed silky fibrillose downward, pruinose toward the apex, brownish to bister or very dark toward the base, apex pallid to grayish, slightly bluish green at the base.

Veil as white arachnoid cortina in the young specimens, soon evanescent. No annulus present in mature specimens.

Context in the pileus whitish and pliant; in the stipe is brownish and cartilaginous. Slightly blue when cut. Taste and odor farinaceous mainly when crushed in flesh young specimens.

Spore print dark violaceous brown.

Spores (6.6-) 8.5-9.5 (-11) × (3.8-) 4.4-5.5 (-6) μm , subellipsoid or ellipsoid both in side and face view, moderately thick walled (0.5-1 μm), yellowish brown, with a broad and apical germ pore.

Basidia 16-30 × 5.5-8 μm , 4-spored, hyaline, ventricose, sometimes with a slight median constriction.

Pleurocystidia absent.

Cheilocystidia 24-34 (-40) × 4.4-6.6 (-8.8) μm , abundant, forming a sterile band, hyaline, fusoid-ventricose to lageniform with long and flexuous neck 1.6-2.2 μm broad, often pedicellate.

Subhymenium thin, subcellular with short elements, yellowish brown, not so incrustated. Trama parallel, hyaline or brownish yellowish, lacking pigment incrustations. Epicutis formed by a thin gelatinous hyaline pellicle, with hyaline to yellowish filamentous hyphae 1-3 μm broad, slightly incrustated. Hypodermium subcellular formed by compactly arranged hyphae 3-10 μm broad, more highly pigmented than the subhymenium, and with incrustated pigment on the walls. Clamp connections very common.

HABITAT AND DISTRIBUTION. Scattered to gregarious, not caespitose, on debris of conifers or amongst fallen leaves of hardwood trees, rarely on twigs or very rotten wood, in conifer or deciduous (mainly *Fagus grandifolia*) forests. Fruiting in September to November. Known from eastern and western U.S.A., and northern Europe.

STUDIED MATERIAL. U.S.A., Idaho, Upper Priest Lake, *Smith* 73393; 73511; 73405 & 73679 (MICH). New York, North Elba, *Peck* s.n. (NYS Type). Oregon, West Lake, *Menser* 874 (ENCB). Washington, near Olympia, *Guzmán* 16619 (ENCB); *Leslie* 3827; 3842 & 3844 (ENCB). Grays Harbor, near Copalis Beach, *Leslie* 1822 (ENCB). Mt. Rainier Nat. Park, *Smith* 39814 & 40205 (MICH). Thurston, Oyster Bay road of Highway 101 near Shelton, *Stamets* 77-25 & 77-26 (ENCB). Snohomish, Lee Forest, *Stuntz* 13302 (WTU).

FINLAND, Helsingfors, *Malmstrom* s.n. (13-IX-1954) (H as *Tubaria inquilina*). Tavastia, Tammela, *Syrjä*, *Karsten* 1561 (H as *P. nitidum* var.).

SWEDEN, Småland, Femsjö, *Horak* s.n. (24-IX-1976) (ZT 76-206 as *P. tenax*).

DISCUSSION. This species is very close to *P. pelliculosa* (Smith) Sing. & Smith (see discussion of that). The records of *P. silvatica* from the northwestern U.S.A. and from Finland and Sweden are new. Singer & Smith (1958b) reported this species only from eastern U.S.A. and Canada. It is interesting to see that both *P. pelliculosa* and *P. silvatica* grow in northern Europe in conifer forest.

This is a hallucinogenic mushroom (Singer & Smith, 1958b) but no chemical studies have been made.

The name of the species refers to the forest habitat.

SELECTED ILLUSTRATIONS. Smith (1941a, fig. 1, as *Hypholoma*).

143. *Psilocybe subfimetaria* Guzmán & Smith *Mycotaxon* 7: 518, 1978.

Figs. 175 A-C & 781

Pileus (5-) 8-12 (-20) mm in diam., conic to campanulate or subumbonate to slightly expanded, glabrous, even, translucent-striate when moist, viscid, hygrophanous, ochraceous brown or brownish olivaceous, fading to straw color, bluing when touched or injured.

Lamellae adnexed, clay colored at first, becoming violaceous brown, edges sometimes pallid.

Stipe 25-45 × 2-3 mm, equal but with subulbous base, hollow, white to whitish, staining slightly blue where touched.

Veil well developed as a white-silky arachnoid of fibrillose layer, forming a fibrillose zone or subannulus that is soon evanescent or at times somewhat permanent.

Context white to whitish both in pileus and stipe, and pliant. Odor and taste farinaceous, mainly in young specimens and when crushed. Bluing when cut or injured. KOH staining cap surface brown, the context reddish brown, and the stipe negative.

Spore print dark violaceous brown.

Spores (9.9-) 11-12 (-13.7) $\times$ 6.6-7.7 $\times$ 6-6.6 μm , subellipsoid in face view, somewhat irregular subelliptic in side view, thick-walled (1 μm) ochraceous brown, with a broad apical germ pore.

Basidia 22-33 $\times$ 8.8-11 μm , 4-spored, hyaline, clavate to ventricose.

Pleurocystidia absent.

Cheilocystidia 20-28 $\times$ 5-6.6 μm , abundant, forming a sterile band, hyaline, ventricose-fusoid, some subpedicellate, more commonly lageniform with a long and flexuous neck 1-2 mm thick.

Subhymenium hyaline to yellowish, subcellular with short and globose elements somewhat incrusting on the walls. Trama regular, hyphae hyaline, not incrusting. Cuticle of pileus and ixocutis of hyaline, gelatinized and thin hyphae. Hypodermium composed of elongated to somewhat globose hyaline hyphae, somewhat incrusting. Clamp connections present.

HABITAT AND DISTRIBUTION. Solitary to gregarious on dung in meadows and other grassy areas.

Known only from Vancouver (Canada) and from Oregon (U.S.A.), and from Chile. Fruiting October-November in North America and in August in Chile.

STUDIED MATERIAL. CANADA, British Columbia, Vancouver City, *Guzmán 16677* (Type, ENCB; isotype MICH); *Guzmán 16629* (ENCB).

U.S.A., Oregon, near Siltcoos Station, *Guzmán 16665* (ENCB); Lane County, Dune City, *Menser 859* (ENCB), *Leslie 3929* (ENCB).

CHILE, Maule, between Chovellen and Trehyalene, *Singer M-7214* (SGO 92890 as *P. maulensis* Sing. ined.).

DISCUSSION. This species is close to *P. fimetaria* (Orton) Watling because of the details of its annulus, habit, and habitat, but the type of *P. fimetaria* has spores (9.5-) 11-14 (-16) $\times$ 6.5-8.5 (-9.5) μm . It is also similar to *P. semilanceata* (Fr. ex Secr.) Kumm. but spore size separate well both species, besides the annulus, as well the more umbonate or papillate pileus in that. *P. pelliculosa* (Smith) Singer & Smith is also closely related to *P. subfimetaria*, but it grows on debris and humus in conifer forests, and has spores (8.2-) 9.3-11 (-12) $\times$ 5-6 μm , and its veil is poorly developed to rudimentary. From *P. liniformans* Guzmán & Bas it differs in the form of the pileus, in the spores (12-) 13-14.5 (-16.5) $\times$ 7.5-10 μm , and in the absence of a veil. *P. subfimetaria* is an hallucinogenic fungus, used as drug in western North America. Leslie found that it contained psilocybin. The record from Chile is new for this species.

The name of the species refers to its similarities to *P. fimetaria*.

144. *Psilocybe venenata* (Imai) Imaz. & Hongo in Hongo, *Jour. Jap. Bot.* 32: 146, 1957. Figs. 628-634 & 739

Stropharia caerulea Imai, *Trans. Sapporo Nat. Hist. Soc.* 12: 148, 1932 (non *S. caerulea* (Pat.) Sing., *Ann. Myc.* 34: 340, 1936).

S. venenata Imai, *Jour. Facul. Agric. Hokkaido Univ.* 43: 270, 1938.

Psilocybe fasciata Hongo, *Jour. Jap. Bot.* 32: 114, 1957.

Pileus (10-) 15-40 (-60) mm in diam., conical at first, gradually becoming convex to subumbonate to subplane or somewhat depressed at the center but slightly upturned at the margin, glabrous, but in young specimens with minute fibrillose scales from the veil along the margin, even, but slightly striate at the margin when wet, viscid, with the pellicle separable, hygrophanous, warm-buff or pinkish-buff, light blonde brown to cinnamon-buff, olive brown or buckthorn-brown, becoming paler to grayish green, brownish or ochraceous, rarely whitish, often tinged with green when touched or injured.

Lamellae adnate or adnexed, with slightly decurrent ends, whitish, light greyish or dingy-yellowish at first, finally purplish-brown or greyish violet brown, with whitish and subfloccose edges.

Stipe (40-) 50-70 (-90) $\times$ (2-) 4-6 (-9) mm, cylindrical, equal or nearly equal, frequently composed, uneven, silky white, dry, fibrous, especially below the annulus, furfuraceous punctate above, stuffed or hollow, base strigose or with white rhizomorphs.

Veil well developed as a white floccose coat, forming a more or less permanent or evanescent white silky annulus, very thin and delicate.

Context whitish or grayish, turning to azure-blue when bruised. Taste and odor somewhat farinaceous.

Spores (8-) 9.9-12 (-14) $\times$ 6-7 (-8.8) $\times$ 5.5-6.6 μm , subellipsoid both in side and face view, or somewhat inequilateral in side view, thick walled (1-1.5 μm), yellowish brown, with a broad apical germ pore.

Basidia 12-28 $\times$ 6-8.8 μm , 4-spored, hyaline, subventricose, with a slight medium constriction.

Pleurocystidia absent.

Cheilocystidia 17-30 (-36) $\times$ 4.4-7.5 μm , abundant, forming a sterile band, hyaline, fusoid-ventricose subpedicellate, lageniform with long and flexuous neck 1-2.5 μm broad, sometimes with a viscous hyaline drop at the apex up to 17 μm diam.

Subhymenium seemingly subcellular with short globose elements, hyaline to yellowish brown, without incrusting pigment on the walls no so conspicuous. Trama parallel, yellowish to hyaline with unincrusted elongated hyphae, 4-18 μm broad. Epicutis formed by a thin layer of gelatinized hyaline hyphae, up to 3.5 μm broad. Hypodermium hyaline or yellowish brown, subcellular with elongated or subglobose unincrusted or somewhat incrusting hyphae, 3-10 μm broad. Clamp connections present.

HABITAT AND DISTRIBUTION. Gregarious to densely caespitose on soil, rotten wood, straw, decayed rice hulls, or on dung, on roadsides or lawns in deciduous or bamboo forests. Fruiting from summer to autumn. Known only from Japan.

STUDIED MATERIAL. JAPAN, Sapporo, Hokkaido, Prov. Ishikari, near Asahikawa, Imai s.n. (Oct. 13, 1931) (TNS Type, SAPA Isotype); Imai s.n. (Jul. 5, 1932) (TNS). Mutsu, Imai s.n. (1936) (TNS). Kumuimura, Asahigawa, Imai s.n. (Oct. 11, 1931) (TNS). Inaba, Imai s.n. (May 19, 1932) (TNS). Otsu, Ishiyama-Senjo, Hongo 1338 (Type of *P. fasciata*, Herb. Hongo); Hongo 1371; 2189; 2428 & 3385 (Herb. Hongo) (all as *P. fasciata*). Tottori-city, Kokoge, Nagasawa EN-Ps-1, EN-Ps-2; EN-Ps-4 & EN-Ps-5 (Herb. Tottori Myc. Inst. & ENCB), Imazequi & Nagasawa 6 (Herb. Hongo). Niida, Akita-city, Nagasawa EN-Ps-3 (Herb. Tottori Myc. Inst. & ENCB).

DISCUSSION. This Japanese species is close to the American species *P. caerulipes* Peck and the European species *P. serbica* Moser & Horak. However, the floccose annulus distinguishes this species. It is also close to *P. fimetaria* (Orton) Watling and *P. subfimetaria* Guzmán & Smith because of its annulus, but the annulus is better formed in *P. venenata* and the size of spores is different, as well the size of the fruit body.

This is a hallucinogenic fungus because of the bluing feature and its strong relationship with other species of the Section *Semilanceatae*. Imai (1932; 1938) reported *Stropharia venenata* as a poisonous fungus, but is only produced intoxications, not death. The symptoms were similar to those of an hallucinogenic drug, with delirium, hallucinations and temporary paralysis of the limbs.

Imazequi and Hongo (in Hongo, 1957) made the combination of Imai's species in *Psilocybe*, but the specimens considered by Imazequi & Hongo (1969) as *P. venenata* do not agree with Imai's fungus, but they do conform well with *P. subaeruginascens* Höhnelt in their subrhomboid small spores according with the herbarium materials (see *P. subaeruginascens* in Sect. *Stunzae*). It may be the same with the record of Ito (1959).

P. venata was considered a synonym of *P. subaeruginascens* Höhnelt by Singer & Smith (1958b), based only in Imai's description. They did not study the type. Heim (in Heim & Wasson, 1958) discussed Imai's species as close related to *Stropharia cubensis* Earle. One specimen from Sapporo collected by Otani (Oct. 3, 1955) and identified in TNS Herbarium as *Stropharia venenata* belongs to *Stropharia* sp. for the chrysocystidia present.

The synonym with *P. fasciata* Hongo is for first time proposed and is based on a study of the type (Hongo 1338), which correspond well with the type of *P. venenata* at TNS. Hongo (1957) described this species from Japan. He described a fungus with spores $9.5-11 \times 5-6 \mu\text{m}$, ellipsoid to slightly ovoid, cheilocystidia $21-28 \times 6.5-8 \mu\text{m}$, abundant, ventricose and with a slender neck, and with a veil "albo-fibriloso fugaci". He related his species to *P. caerulipes* (Peck) Sacc.

The name of *P. venenata* refers to the "poisonous" properties "observed" in this fungus.

SELECTED ILLUSTRATIONS. Imai (1932, fig. of pag. 149) (as *Stropharia caerulescens*); Imazequi & Hongo (1969, pl. 20, fig. 126 as *P. fasciata*) (non Imazequi & Hongo, 1971, pl. 26, fig. 148, that is *P. subaeruginascens* Höhnelt).

APPENDIX

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2. Doubtful species

The following taxa are insufficiently known, because the types unfortunately were unable to study or they are in bad conditions. The author failed to locate the types of Britzelmayer and Velenovsky, and others, as well as many of Fries. Other materials, as those of Cleland, Cooke, Berkely & Broome and Masse, deposited in K Herbarium were unable to study by the author because this herbarium did not send specimens by loan.

Psilocybe adnata Vel., *Ceska Houby 1*: 584, Fig. 4, 1921. No material was found at PRM Herbarium. Velenovsky (1921) did not described this species, only presented a figure with two fruit bodies, spores and cystidia. Pilát (1948) also did not describe this species.

Psilocybe aggregata Clel. & Cheel, *Trans. & Proc. Royal South Austr.* 42: 134, 1918. It was described (Cleland & Cheel, 1918) from New South Wales, Australia; probably it is a *Psathyrella* sp.

Agaricus (Psilocybe) agnarius Fr., sensu Berkeley & Broome, *Not. Brit. Fung.*, No. 1257, 1871. This is probably *Agaricus agrarius* Fr. (= *Psilocybe agraria* (Fr.) Karst., *Bidr. Finl. Nat. Folk* 32: 505, 1879, a doubtful species). Berkeley & Broome (1837-1885) wrote: "About the roots of decayed trees". "Allied to *A. coprophilus*. In colour the pileus somewhat resembles *Hygrophorus ovinus*".

Psilocybe agnata (Britz.) Sacc., *Syll. Fung.* 5: 1047, 1887. This was described from Bavaria as an *Agaricus* by Britzelmayer in 1883. Konrad & Maublanc (1924) considered this as a species "peu connue ou douteuse". No material studied.

Psilocybe agraria (Fr.) Karst., *Bidr. Finl. Nat. Folk* 32: 505, 1879. Fries (1857-1863) described this fungus as *Agaricus agrarius* but Berkeley & Broome (1837-1885) described this as *Agaricus (Psilocybe) agnarius* Fr. (see discussion of that). The color plate 597 (622) of Cooke (1881-1891) seems to be a species of *Psathyrella* or according Pearson & Dennis (1948), this is possibly a *Mycena*. Bartholomew's specimens at Peck's Herbarium (NYS) as *Agaricus agrarius* belongs to a *Psathyrella* sp. Quélet (Pearson, 1936) considered *A. agrarius* as *Mycena sudora*.

Psilocybe agraria var. *longipes* Kill., *Denkschr. Bayer Bot. Ges.* 20: 72. 1936. No material studied.

Psilocybe agrariella var. *vaccinii* Charles, in Shear, Stevens & Bain, *U.S. Depart. Agric. Tech. Bull.* 258: 12, 1931. No studied material. Charles (1931) described this variety from cranberry bogs from Massachusetts, U.S.A., formed fairy rings. It is probably a species of *Psathyrella* (see *Psilocybe agrariella* Atk., in Excluded species.

Psilocybe albobrunnea Lutz, *Bull. Soc. Bot. Fr.* 54: 151, 1907. Non *P. albobrunnea* Beeli (= *Psathyrella candolleana* (Fr.) Maire). No material studied.

Psilocybe alboquadrata (Berk.) Sacc., *Syll. Fung.* 5: 1043, 1887. This species was described by Berkeley (1885, p. 386) from Tanzania, Zanzibar (Africa). "The spe-

cies is based on a water colour drawing only, which was reproduced by Pegler (1975), fig. 4/4", Pegler wrote (1977).

Psilocybe antillarum var. *praelonga* Fr., *Nova Acta R. Soc. Sci. Upsal.* III, 1: 25, 1851. Described from Puerto Rico (Fries, 1851). No material was studied. Stevenson (1975) reported it as a doubtful form. Murrill (1918) considered it as a probable synonym of the type variety (= *Panaeolus antillarum* (Fr.) Dennis).

Psilocybe appendiculata Rick, *Broteria*, *Ser. Bot.* 18: 62, 1920. No material studied.

Psilocybe araucana Sing., *Nova Hedwigia* 29: 239, 1969. Singer (1969) described this species from Argentina as a bluing species. Later (Singer, 1975) included it Sect. *Caerulescentes* Sing., but the type (noted as in BAFC and SGO) could not be found in any herbarium nor were other specimens found. It is probably close to *P. acutipilea* (Speg.) Guzmán of the Section *Mexicanae* Guzmán.

Psilocybe areolata var. *virescens* Cooke & Mass., *Illustr. Brit. Fungi*, pl. 1177, 1889 (see *P. virescens*).

Agaricus (Psilocybe) arrosus Schulzer, *Verh. K.K. Zool. Bot. Ges. Wien*, p. 418, 1876. The only bibliography record known by the author is that from Just (1878), but any herbarium material was found studied.

Psilocybe atomatoides Thom. & Lathrop., *Jour. Agric. Research* 30: 625, 1925. No material studied.

Psilocybe atrorufa f. *brevipes* Kill., *Denksch. Bayer Bot. Ges.* 20: 78, 1936. Probably a synonym of *P. montana* (Pers. ex Fr.) Kumm., but no material studied.

Psilocybe atrorufa f. *longipes* Kill., *Denksch. Bayer Bot. Ges.* 20: 77, 1936. Probably a synonym of *P. montana* (Pers. ex Fr.) Kumm., but no material studied.

Agaricus (Psilocybe) bulbosulus Schulzer, *Verh. K.K. Zool. Bot. Ges. Wien*, p. 417, 1876. Just (1878) reported this species. No material studied.

Psilocybe campanulatus (Bull. ex Fr.) Kumm., *Führ. Pilz.*, p. 71, 1871. This species is probably the same as *Panaeolus campanulatus* (L. ex Fr.) Quél. (= *Agaricus campanulatus* L. ex Fr.), but this synonymy is not considered by Ola'h (1969), nor by Singer (1975).

Psilocybe canificans Cooke. See *P. canofaciens* below.

Psilocybe canobrunnea (Batsch ex Fr.) Kumm. *Führ. Pilz.*, p. 71, 1871. No material studied, and not considered in any of the modern bibliographies except in Ricken's description (1915).

Psilocybe canofaciens Cooke, *Grevillea* 14: 1, 1885. No material studied. This species was described from England based in a specimens collected in decaying straw by W.G. Smith and identified as *Agaricus areolatus*. According to Dring (personal communication) the type is not in K. Cooke (1881-1891, pl. 621) illustrated this species as *Agaricus (Hypholoma) canofaciens*. Cooke's color plate seems to be a species of *Psathyrella*. Konrad & Maublanc (1924-1937) considered Cooke's fungus as synonym of *Psathyrella helobia* (Kalchbr.) Saccardo. This latter author

(1887) described the fungus as "*Psilocybe canificans* Cooke" and with this name was reported by Laplanche (1894). Murrill (1923) considered *P. canofaciens* as doubtful species, but Kauffman (1918) described it from Michigan. A specimen in BPI collected by Grant in Washington State in Nov. 1924 belongs to a *Psathyrella* sp.

Psilocybe cavipes House, *Bull. N.Y. State Mus.* 205-206: 40, 1919. No material studied. Murrill (1923) considered this as synonym of *Psilocybe camptopoda* (Peck) Sacc. (= *Psathyrella*).

Psilocybe ceres (Cooke & Mass.) Sacc., *Syll. Fung.* 9: 140, 1891. Guzmán & Watling (1978) stated "A species of doubtful affinity: type (in NY) in bad condition. - Probably synonymous with *Naematoloma aurantiaca* (Cooke) Guzmán". *P. ceres* was described from several localities in South Australia. Pegler (1965) described spores 11-12.5 × 6-8 µm, showing all characters of the Strophariaceae, and pleurocystidia "probably lageniform or utriform with a large refrigent inclusion". Pegler wishes to retain the taxon in *Psilocybe* in the meantime. But for the chrysocystidias this is a species of *Naematoloma*, probably *N. aurantiaca* (Cooke) Guzmán (see Guzmán, 1975).

Psilocybe chrysocystidiata Sing., *Beih. Sydowia* 7: 72, 1973. The study of the type (at BAFC, from Bolivia) revealed that it has typical chrysocystidia, with a yellow inclusion, and small, 4.5-5.5 (-6) × 3-4 µm pale brownish spores. It is likely that this is a species of *Pholiota*. Its lignicolous habitat enforces the surmise, but as only one small specimen is the only available material for study, it is considered for the moment as a doubtful species. The spore print is unknown.

Agaricus (Psilocybe) compactus Fr., *Syst. Myc.* 1, p. 290, No material studied.

Psilocybe comta (Fr.) Sacc., *Syll. Fung.* 5: 1050, 1887. A species confused with *Agaricus comtulus* Fr., a true *Agaricus* (or *Psalliota*, Kühn. & Romag., 1953). Berkeley & Broome (1837-1885) described it as *Agaricus (Psilocybe) comptulus* (No. 917). Saccardo (1887) considered Berkeley and Broome's fungus as a synonym though they wrote "*comptulus*" instead of *comtulus*. The plate 603 (589) of Cooke (1881-1891) as *Agaricus (Psilocybe) comptus* Fr., represents a fungus similar to a species of *Psathyrella* or *Galera*. Konrad & Maublanc (1924-1937) considered *Psilocybe comta* Fr. (= *Agaricus comptulus* B. & Br.) as a species "peu connue ou douteuse". Dennis *et al.* (1974) considered *A. comptulus* Fr. in the genus *Agaricus*, but Dennis *et al.* (1960) considered it as doubtful species. Maire and Quélet (in Pearson, 1935) on the evidence of Cooke's plate refer the species to the Bolbitiaceae. Guzmán & Watling (1978) discussed briefly this doubtful species.

Agaricus (Psilocybe) comptulus B. & Br., *Not. Brit. Fung.*, No. 917. 1860 (see *Psilocybe comta* (Fr.) Sacc.).

Psilocybe cookei Sacc., *Syll. Fung.* 5: 1043, 1887 (not *P. cookei* Sing. = *P. callosa* (Fr. ex Fr.) Quél., Section *Semilanceatae* Guzmán). Saccardo's species is a probable synonym of *Psathyrella sarcocephala* (Fr.) Sing. Saccardo (1887) based his species on pl. 620 of Cooke (1881-1891) labelled as *Agaricus sarcocephalus* Fr. According to Pearson & Dennis (1948, p. 184) *Psilocybe sarcocephala* var. *cookei* Sacc. is a large form of *Psilocybe spadicea*.

Psilocybe coprinifacies (Roll.) Pouzar, *Ceska Myk.* 7: 140, 1953. = *Stropharia coprinifacies* Rolland, *Bull. Soc. Myc. Fr.* 14: 82, 1898; *Hypholoma coprinifacies* (Roll.) Herink, *Ceska Myk.* 4: 16, 1950. This fungus according to the original description which includes a good plate (Rolland, 1898) has a robust fruit body with an annulus, and it is like a species of *Panaeolus* or a true *Stropharia*. According to Rolland it is close to *Stropharia aeruginosa* or *S. albocyanea*. However the fungi of Herink (1950) and Pouzar (1953) seem to be *Psilocybe serbica* Moser & Horak according to their descriptions. They showed a bluing, non-annulate fungus. Further, Semerdzieva & Nerud (1973) isolated psilocybin from a Czechoslovakian fungus identified as *P. coprinifacies*. The author studied a collection in the Patouillard Herbarium collected in Oct. 1898 and identified as *Stropharia coprinifacies* Roll. (at FH); this agrees with a *Stropharia* sp. It has chrysocystidia and large spores (11.2-) 12.5-19 (-22.5) μm long. On the other hand, a note with a description of *Hypholoma coprinifacies* (Roll.) Herink wrote by Horak (at ZT) seems to agree with *P. atrobrunnea* (Lasch) Gill. (see discussions of *P. cyanescens* and *P. serbica*).

Psilocybe coprophila var. *vomiticola* Kill., *Denkschr. Bayer Bot. Ges.* 20: 76, 1939. No material found in any herbarium.

Psilocybe cordobensis Sing., *Beih. Sydowia* 7: 83, 1973. Unfortunately the type was impossible to study. It is not at BAFC, SGO, F, MICH or NY, where Singer usually deposited his types. Singer (1973) described this species from Córdoba, Argentina and later (1975) he considered this species in the Section Chrysocystidiatae Sing.

Psilocybe corneipes (Fr.) Karst., *Bidr. Finl. Nat. Folk* 32: 504, 1879. This species was described by Fries (1857-1863) and later considered (1874) from forests in Europe as *Agaricus (Psilocybe) corneipes*. Quélet (1888) considered it *Geophila corneipes*. Later Konrad & Maublanc (1924-1937) considered it as a doubtful species. Morgan (1907) and Smith (1938, 1949, 1975) described this fungus from the Northwestern U.S.A., but all of the Smith's material studied by the author of the present monograph (at MICH) belong to a species of *Galerina*, for it has slightly rough or punctate light brownish spores and thick walled hyaline or pale brownish pleurocystidia, often with incrusted apices. The color of the gills is a pale brownish pink. However Smith (*op. cit.*) did not described, in any case, the rough or punctate spores. This is a very important feature in considering the exclusion *P. corneipes* sensu Smith from the genus *Psilocybe*, and as authentic material from Europe have been impossible to study, *P. corneipes* (Fr.) Karst. is presently considered a doubtful species.

Psilocybe cylindrispora Pearson, *Trans. Brit. Myc. Soc.* 33: 306, 1950. Species described from South Africa. Type not studied. Pearson (1950 b) described a fungus with spores brown subtranslucent, cylindrical, 9-10 $\times$ 3.5-4 μm , smooth and with germinative pore; pleurocystidia cylindric 7-8 μm diameter with thin walls and with hymeniform pileus, formed by sack-shaped cells 18-25 μm wide. Probably this fungus belong to a species of *Agrocybe*.

Psilocybe delita (Britz.) Sacc., *Syll. Fung.* 5: 1046, 1887. No material studied. According to Saccardo (1887) it is close to *P. uda* (Pers. ex Fr.) Gill. (= *Naematoloma*, Karsten). A color plate in Cooke (1881-1891) in fact agrees well with *P. uda*.

Pholiota depauperata (Sing. & Smith) Smith & Hesler, *North American Species of Pholiota*, p. 121, 1968. First described as *Kuehneromyces depauperatus* Sing. & Smith, *Mycologia* 38: 513, 1946, but Smith & Hesler (1968) wrote: "All the features of this species are typical of *Psilocybe*, especially the cheilocystidia, spore size and shape, and color of the mature gills". It is only known from Florida on rooting wood. The spores are 6.2-6.8 $\times$ 3-4.4 μm , subrhomboid to ellipsoid. No pleurocystidia. However no material was studied by the author.

Psilocybe desertorum Vel., *Opera Bot. Cechica* 6: 226, 1948. This species was described first by Velenovský (1921) in Czech-Slovak language. Pilát (1948) described it in Latin. No material was found at PRM Herbarium.

Psilocybe dichroa (Pers.) Karst., *Medd. Soc. F. Fl. Fenn.* 5: 31, 1879. Persoon (1801, p. 343) described *Agaricus dichrous* in the Section *Gymnopus* growing "ad terram", but he also described (1801, p. 413) *Agaricus dichrous* in the Section *Coprinus*, together with *A. ericaceus*, growing in "prates montosis, regionibus arenosis". Fries (1821-1832, I, p. 202) considered *A. dichrous* in the Tribu *Leptonia* growing "ad terram", and he referred this fungus to Persoon, p. 343. He did not consider the fungus of Persoon, pag. 413. Karsten first considered this fungus as *Psilocybe ericacea* var. *dichroa* (Pers.) Karst., but later (1879) he described the fungus as *Psilocybe dichroa* (Pers.) Karst. Unfortunately it was impossible to study materials of *P. dichroa* from the Karsten Herbarium; it seems that there are no collections of *P. dichroa* in that Herbarium (at H). Lange (1936; 1939) considered "*P. dichroa* form" of Karsten possibly as *P. subericaceum* Fr. Later Kühner & Romagnesi (1953) considered *Agaricus dichrous* as a synonym of *Geophila (Hypholoma) subericaceum* (ss. Rea) Kühn. & Romag. Singer (1975) considered *P. dichroa* Karst. as a synonym of *P. atrobrunnea* (Lasch) Gill. and *Naematoloma subericaceum* (Fr.) Sing. as an independent species with common chrysocystidia. A collection of Linder from U.S.A. (at FH) labelled as *Psilocybe dichroa* belongs to a *Naematoloma* sp. for the precense of chrysocystidia.

Psilocybe dichroa var. *tenuior* (Karst.) Sacc., *Syll. Fung.* 5: 1045, 1887. No material found in the herbarium.

Psilocybe discordabilis (Britz.) Sacc., *Syll. Fung.* 11: 72, 1895. No found in the herbarium.

Psilocybe discordans (Britz.) Sacc., *Syll. Fung.* 5: 1049, 1887. Killermann (1936) considered this fungus as *P. physaloides* var. *discordans* (Britz.) Kill., however no specimens were found in any herbarium.

Psilocybe echinata Clel., *Trans. & Proc. Roy. Soc. South Aust.* 58: 212, 1934. No studied material, but from the description it would not appear to be a *Psilocybe* sp. Guzmán & Watling (1978) discussed this doubtful species.

Deconica examinata (Britz.) Sacc., *Syll. Fung.* 11: 73, 1895. No material found in any herbarium.

Psilocybe exerrans (Britz.) Sacc., *Syll. Fung.* 5: 1056, 1887. No material studied.

Psilocybe farinulenta (Schaeff. ex Fr.) Sacc. *Fl. Ital. Cryp.* 15: 829, 1916. Bresadola (1931) considered this fungus a synonym of *Psilocybe cernua* Vahl, a synonym of *Psathyrella cernua* (Vahl ex Fr.) Quél. On the other hand, Killermann (1936) considered it as *Psilocybe cernua* var. *farinulenta* Schaeff. Unfortunately no material was found any herbarium.

Psilocybe fatua f. *minor* Pereira-Coutinho, *Bol. Soc. Brot.* 9: 209, 1934. It is probably a species of *Psathyrella*, but no material was studied. Pereira Coutinho (1934) described this form from the arid zones of Portugal.

Psilocybe ferrugineo-lateritia (Vogl.) Sacc., *Syll. Fung.* 9: 141, 1891. No studied material.

Agaricus (Psilocybe) flaccescens Schulzer, *Verh. K.K. Zool. Bot. Ges., Wien*, p. 418, 1876. European not well known species. The only bibliography found on it is that of Just (1878), but no material was found in any herbarium.

Psilocybe floccipes (Fr.) Kill., *Denssch. Bayer Bot. Ges.* 20: 78, 1936. No material studied. According to Killermann (1936) this is *Collybia floccipes* Fr. sensu Cooke, *Illust. Brit. Fung. No.* 1142 (1168), and according to Rea (1922) the spores of this fungus are "white, subglobose, prominent apiculate", which agrees well with a *Collybia* sp.

Psilocybe granulata Naveau, *Natur. Tijd.* 5: 85, 1923. No material studied.

Psilocybe hebes (Pers. ex Fr.) Sacc., *Syll. Fung.* 5: 1054, 1887. Fries (1821-1832) considered this fungus as *Agaricus obtusatus* var. *hebes*, following Persoon (1801), of which the typical var. according to Smith (1941 a) is *Psathyrella obtusata* (Fr.) Smith. *P. hebes* according to Cooke's iconography (pl. 589) (1881-1891) seems in fact to be a *Psathyrella*. Konrad & Maublanc (1924) considered *Psilocybe hebes* as a doubtful species.

Psilocybe hebes f. *major* Bres. Reported by Killerman (1936). No material studied.

Psilocybe helobia (Kalchbr.) P.Henn., *Natür. Pfl. Fam.* 1 (1**): 235, 1900. No material studied.

Psilocybe helvola (Schaeff.) Mass. No material studied. Rea (1922) described this species. Konrad & Maublanc (1924-1937) considered it as doubtful species. According to Pearson & Dennis (1948) probably is a *Panaeolus*.

Psilocybe henningsii Jugner, *Zeits. Pflanzenkr.* 16: 131, 1906. No material studied. Species described from Germany (Saccardo, 1912).

Psilocybe heterosticha (Fr.) Sing. *Nova Hedwigia* 29, p. 248, 1969. = *Agaricus furfuraceus* var. *heterostichus* Fr., *Epicr.* p. 200, 1838. This species was described by Singer (1969) from Argentina and U.S.S.R. According to Singer this is a very closely related to *P. crobula* (Fr.) Lange ex Sing. "but differs in the larger, relatively not very broad spores and the much more strongly striate pileus" (Singer, *op. cit.*). Unfortunately it was not possible for the author to study collections of this species (in BAFC and W it seems there are no collections).

Agaricus hyperellus Fr., *Elench. Fung.* 1: 35, 1828. Doubtful species, but *Geophyl-*

lus hyperella (Fr.) sensu K. & R. is actually *Psilocybe xeroderma* Huijs. (Huijsman, 1961).

Psilocybe hysipoda Fr. This species was reported by Rick (1967) as *Psathyrella hysipoda* Fr., but he presented a plate of it as *Psilocybe hysipoda* without any explanation. Singer (1975) and Smith (1972) did not consider this species.

Psilocybe insiliens (Britz.) Sacc., *Syll. Fung.* 5: 1049, 1887. No material studied.

Agaricus (Psilocybe) insipidus Schulz., *Verhandl. K.K. Zool. Bot. Gesellschaft (Wien)* 30: 487, 1881. No material studied.

Psilocybe interjungens (Britz.) Sacc., *Syll. Fung.* 5: 1055, 1887. No material studied.

Psilocybe iodoformica Pat., *Bull. Mus. Nat. Hist.* 6: 531-1924. The type is not at FH Herbarium, neither in PC. This species was described from Madagascar and was characterized for its strong odor to iodine (Patouillard, 1927).

Psilocybe jujuyensis Sing., *Beih. Sydowia* 7: 82, 1973. Species originally described from Argentina and the type was deposited at F, though it could not be found by the author, neither in BAFC and LIL. According to Singer (1975) it belongs to the Section *Septembres* Sing. and has chrysocystidia.

Psilocybe libertatis (Batsch ex Fr.) Möller, *Fungi Faeröes I*, p. 187, 1945. Möller (1945) considered this fungus as *Deconica libertatis* (Batsch) Sacc., and noted to be synonym with *Psilocybe libertatis* (Batsch) Fr. However as Fries (1836-1838, p. 229) described this fungus as *Agaricus libertatis*, the combination in the genus *Psilocybe* was made by Möller. According to Möller's description, this species is possibly a synonym of *P. montana* (Pers. ex Fr.) Kumm. Ricken (1915) considered *P. libertatis* as a form of *P. atrorufa* (Schaeff. ex Fr.) Quél. (also a synonym of *P. montana*), as did Konrad & Maublanc (1924-1937). Orton (1969) considered *P. libertatis* as a valid species. However no material was studied by the author.

Deconica lipophila (Oudem.) Sacc., *Syll. Fung.* 16: 125, 1902. No material found in any herbarium.

Psilocybe longinqua Sing., *Mycologia* 51: 578, 1959. This species was described from Macquarie Islands in the Australian subantarctic. Singer (1959b) described a fungus on humus, with ellipsoid spores, $8.8-11 \times 6.5-8.8 \mu\text{m}$ without suprahilar depression or applanation, with a narrow not flattened germ pore, with triple wall, and cystidia hyaline. Unfortunately the type material said to be at LIL could not be located and studied, neither in BAFC. Singer (1975) considered this species as probably in the Section *Merdariae*.

Psilocybe lysiphylla (L. ex Fr.) Sacc., *Syll. Fung.* 5: 1045, 1887. Species described from Brazil, but no material was studied.

Psilocybe macrocystis Heim, *Compt. Rend. Séan. Acad. Sc.* 242: 1932, 1956. Nom. nudum. This species was originally described from Mexico (State of Mexico) in French. According to Heim (1956 b) it has large pleurocystidia and is close to *Psilocybe cystidiosa* Peck (= *Psathyrella cystidiosa* (Peck) Smith). The type was not found in PC.

Psilocybe maxima Vel., *Opera Bot. Cechica* 6: 224, 1948. Velenovsky (1921) first described this species in Czechoslovak language, and Pilát (1948) in Latin. No material was found at PRM Herbarium. According to the descriptions it is close to *P. merdaria* but differs in the spores.

Psilocybe mesospora Sing. *Nova Hedwigia* 29, p. 245, 1969. Species described from Argentina, but the selected type at BAFC could not be found by the author, nor in other herbaria where Singer usually deposited his collections. Singer (1975) considered this species in the Section *Merdariae*.

Psilocybe murcida (Fr.) Karst., *Bidr. Finl. Nat. Folk* 32: 507, 1879. Kühner & Romagnesi (1953) considered this species as *Drosophila murcida* (Fr. sensu Rick.) K. and R. and they say that according to Ricken it is a *Psathyrella*, while Fries (1836-1838) considered it in the tribu *Psilocybe*. Konrad & Maublanc (1924-1937) considered this species as doubtful. Hesler (1937) reported *P. murcida* from the U.S.A., but the herbarium material that was studied (TENN 9698 & 3051) belong to a species of *Psathyrella*. Smith (1972) did not consider this species. Lange (1936) regarded *P. murcida* as a *Psathyra*.

Psilocybe musci Clel. & Cheel, *Trans. & Proc. Roy. South Austr.* 42: 131, 1918. Type not studied. It was described from Australia (Cleland & Cheel, 1918).

Psilocybe nemophila (Fr.) Gill., *Les Hymén.*, p. 586, 1878. - No material studied. Konrad & Maublanc (1924-1937) considered this a doubtful species.

Psilocybe nitidipes (Peck) Morgan, *Jour. Myc.* 13: 253, 1907. Peck according to Morgan (1907) described this species as *Agaricus (Hypholoma) nitidipes* Peck. Type not studied.

Psilocybe nitidum (Pers.) Karst., in *Herb.* (Karsten 1560, H). A well preserved specimen, collected at Tavastia, Tammela, Finland, in Sept. 1878, and identified by Karsten as "*Psilocybe nitidum* P." Agrees closely with *P. atrobrunnea* (Lasch) Gill., but another collection: *Karsten 1561* at H, from the same locality agrees with *P. silvatica* (Peck) Sing. & Smith. On the other hand, *Agaricus nitidus* Pers. ex Fr. (Fries 1821-1832, Vol. I, p. 291) seems synonymous with *Agaricus ericaceus* Pers. ex Fr., = *Naematoloma ericaceum* (Pers. ex Fr.) Sing., because Fries (*l.c.*) described it as "*A. ericaceus*,b. pileo subspadiceo: *A. nitidus*, Pers."

Deconica notha (Britz.) Sacc., *Syll. Fung.* 5: 1060, 1887. Type not studied. Konrad & Maublanc (1924-1937) considered this as a doubtful species.

Psilocybe nuciseda (Fr.) Mass. This species was considered by Quélet, Maire and Rea (in Pearson, 1935) to represent *Tubaria inquilina* (= *Psilocybe inquilina* (Fr. ex Fr.) Bres.), but as discussed in the description of *P. inquilina* this is very close to *P. crobula* (Fr.) Lange ex Sing., and only the microscopic characters separate them (see Section *Psilocybe*). Unfortunately no material was studied by the author. Fries (1836-1838) wrote on *Agaricus nucisedus*: "*Habitus exacte A. inquilini*, sed differt sporidiis".

Psilocybe oedipus Mass., *Kew Bull.* 1899: 178, 1899. Species described from Tasmania. Pegler (1965) stated that the type specimens were not retained by collec-

tor, because was used to comprise a water-color painting and a spore print, and after the study of that he concluded that Massee's species belonged to the Subfamily Strophariodeae. In fact, the study of the color painting and the spores from the spore print (in K), show a robust fungus, with spores 5.5-6.6 (-7.7) $\times$ 4-4.4 μ m, smooth, ellipsoid and with a truncate germ pore. Massee related his species to "*Psilocybe sarcocephala*". It may belongs to a species of *Naematoloma*.

Deconica parabilis (Britz.) Sacc., *Syll. Fung.* 5: 1060, 1887. No material studied.

Psilocybe particularis (Britz.) Sacc., *Syll. Fung.* 5: 1056, 1887. No material studied.

Psilocybe parviducta (Britz.) Sacc., *Syll. Fung.* 11: 72, 1895, No material studied.

Hyoholoma peckianum Kauff., *Agar. Mich.* 1: 258, 1918. This species was considered in *Drosophila* by Murrill (1922). This fungus according to Smith's notes at MICH is a *Psilocybe*, but from the description in Smith's notes, it has minutely pitted spores and a non-distinct apical pore, features that separate this species from the genus *Psilocybe*, even from the Fam. Strophariaceae. Kauffman (1918) described this species from humus and was characterized by the viscid pileus, and pleurocystidia absent.

Psilocybe pellosperma Voglino, per Laplanche, *Dict. Champ. Sup.*, p. 299, 1894. No material studied. Laplanche (1894) cited the figures of Bulliard (t. 561 f. 1) and Cooke (t. 577).

Psilocybe pertinax (Fr.) Sacc., *Syll. Fung.* 5: 1044, 1887. According to Kühner & Romagnesi (1953) *P. pertinax* Fr. ss. Ricken is *Drosophila chondroderma* (B. & Br.) Küh. & Romag. (= *Psathyrella chondroderma* (B. & Br.) Smith). The collection 14559 of Rick (at PACA & FH), identified as *Psilocybe pertinax* is a *Panaeolus* sp. Konrad & Maublanc (1924-1937) considered *P. pertinax* as a doubtful species. Lange (1936) pointed out that the *P. pertinax* reported from Denmark is actually *Hypholoma instratum-chondrodermum*.

Psilocybe phoenix (Fr.) Gill., *Les Hymé.*, p. 538, 1878. No material studied.

Psilocybe physaloides var. *discordans* (Britz.) Kill., *Denkschr. Bayer Bot. Ges.* 20: 77, 1936. See *P. discordans* in this chapter.

Psilocybe piterbargii Sing. The type (Singer M-3398) at BAFC from Argentina has chrysocystidia. It seems to be *nomen nudum*, because no bibliography on this species was found.

Psilocybe recognita (Britz.) Sacc., *Syll. Fung.* 11: 72, 1895. No material studied.

Inocybe rhombospora Mass., *Ann. Bot.* 18: 48, 1904. "According the microscopic characters found on the scarce type material (K) this fungus represents a species of *Psilocybe*", wrote Horak (1979). This is not *Stropharia rhombispora* Höhnelt neither *Psilocybe rhombispora* (Britz.) Sacc., both synonyms of *P. phyllogena* (Peck) Peck.

Psilocybe rufa Bres., in Sacc., *Fl. It. Cryp. Hymén.*, p. 834, 1915. No material studied. Saccardo (1925) described this species. Konrad & Maublanc (1924-1937) considered this a doubtful species.

Psilocybe rugosa Vel., *Opera Bot. Cechica* 6: 225, 1948. This species was described first by Velenovsky (1921) in Czecho-Slovak language. Pilát (1948) described it in Latin. According to both description it is close to *P. ericacea* and about the Fig. 5 (Velenovsky 1921) seems a *Psathyrella* sp. No material was found at PRM Herbarium.

Psilocybe sarcocephala var. *cookei* (Sacc.) Kill., *Denkschr. Bayer Bot. Ges.* 20: 70, 1936. See *P. cookei* Sacc. in this chapter.

Psilocybe sclerotifera (Speg.) Sing., *Nova Hedwigia* 29: 240, 1969. A probably bluing and hallucinogenic species described as *Stropharia sclerotifera* Speg., *Bol. Acad. Nac. Córdoba* 23: 38, 1919. It is close to *P. sierra* Sing. and *P. mexicana* Heim according to Singer (1969), but unfortunately no material was studied.

Psilocybe sellae Bres. & Mattiolo, *Ann. Bot. Roma* 7: 145, 1908. Species described from Uganda (Africa). Pegler (1977) briefly noted it. Konrad & Maublanc (1924-1937) considered it as a doubtful species. Unfortunately no material was studied.

Psilocybe septembris (Sing.) Sisng., *Beih. Sydowia* 7: 83, 1973. Singer first (1969) described this fungus as *Pholiota septembris* from Chile, and later (1973) in *Psilocybe* in the Sect. *Septembres* Sing. The type (Singer M-7588) at SGO (92860) is in poor condition, lacking any gills, and impossible to study.

Deconica sepulchrorum (Zoll.) Sacc., *Syll. Fung.* 9: 142, 1891. This fungus was described from Malasia in 1847 as an *Agaricus*. It seems independent of *Agaricus sepulchralis* Berk. (= *Anellaria sepulchralis* (Berk.) Sing.; = *Panaeolus antillarum* (Fr.) Dennis). Unfortunately no materials was studied.

Stropharia siccipes Karst., *Medd. Soc. Faun. Fl. Fenn.* 9: 46, 1882. Some herbarium collections studied by the author (at NY, LIL, PACA, BAFC) were found determined as "*Psilocybe siccipes*" by Singer or other mycologists. Some of them agree well with *P. coprophila* (Bull. ex Fr.) Kumm. or with *P. merdaria* (Fr.) Ricken, but other collections are a *Psathyrella* sp. or *Panaeolus* sp. However *Stropharia siccipes* var. *lugubris* Rick, *Lilloa* 4: 83, 1939 (at PACA 15234) is a synonym of *Psilocybe caeruleoannulata* Sing. ex Guzmán (see Section *Stuntziae* Guzmán). Morgan (1908) reported *Stropharia siccipes* from New York with spores 12-15 × 7-9 µm.

Psilocybe sierrae Sing., *Nova Hedwigia* 29: 240, 1969. Species described from Chile and the selected type is at SGO, but, according to the Director of this Herbarium, it is not there, even in BAFC. According to Singer (1969) it is a bluing species close to *P. sclerotifera* (Speg.) Sing. and *P. mexicana* Heim. "This species belongs in *Stirpe Caerulescentes* but produce the same kind of 'sclerotia' that were observed by R. Heim in *P. mexicana*", wrote Singer (1969).

Psilocybe simulans Karst., *Symb. Myc. Fenn.*, p. 5, 1881. Saccardo's (1887) description agrees more or less with *Psilocybe crobula* (Fr.) Lange ex Sing.; "ad ligna vetusta muscisque", "sporis ovoides, pellucidis, 4-6 × 3 µm", wrote Saccardo. A collection in Finland by Malmstrom (Aug. 27, 1958) (at H), and identified as *P. simulans*, agrees well with *P. crobula*.

Psilocybe squalens (Fr.) Sacc., *Syll. Fung.* 5: 1054, 1887. Konrad & Maublanc (1924-1937) considered this fungus a doubtful species. Spegazzini identified a collection from Misiones, Argentina, as *P. squalens* (LPS 16826), which actually agrees with *Psathyrella* sp. Rea (1922) described *P. squalens* on dead wood, chips and leaves.

Psilocybe subuda (Britz.) Sacc., *Syll. Fung.* 11: 72, 1895. (not *P. subuda* Clel.). No material studied.

Psilocybe subuda Clel., *Trans. & Proc. Roy. Soc. South Austr.* 58: 212, 1934 (not *P. subuda* (Britz.) Sacc.). Type not studied. It seems a species widespread in Southern Australia, but field data in fresh collections are required. It seems belong to the complex *P. ericaceum* (Pers. ex Fr.) Quél.

Psilocybe tegularis (Schum. ex Fr.) Gill., *Les Hymén.*, p. 585, 1878. Lange (1939) wrote (p. 84) "*P. tegularis* is a species of very problematic value, which has not been met with for the last 100 years". Rea (1922) described this species as rarely in grassy places. No material studied.

Geophila tenax (Fr.) Kühn. & Romag., *Fl. anal. champ. sup.*, p. 338, 1953. Species considered in different ways in the bibliography. The fungus of Kühn & Romagnesi (1953) seems a *Psilocybe* for its spores 7.5-10.5 × 4-6 µm, conic pileus, and farinaceous odor. According to Singer (1975) this fungus probably belongs to Section *Atrobrunneae*. But the species described by Rea (1922) as *Naucoria tenax* Fr. seems to be some other fungus because he described spores 13-16 × 7-8 µm. Romagnesi (1937) reported this fungus as *Deconica tenax* (Fr.) Bres. sensu Ricken. Fabry (1977) considered it to be *Psilocybe tenax* (Fr.) Kühn. & Romag. with spores 7.5-8.5 × 5.7-6.2 µm, but these collections (at BRA) agree with *P. semistriata* (Peck) Guzmán (see Section *Psilocybe*). Bresinsky & Hass (1976) considered *Geophila tenax* (Fr.) K. & R. as a synonym of *Galerina medullosa* (a species not considered by Smith & Singer, 1964). Horak's interpretation of *Geophila tenax* falls in *Psilocybe silvatica* (Peck) Sing. & Smith, based on the collection 76/206 at ZT. Fries (1821-1832) described *Agaricus tenax* in the tribu *Psilocybe* as "pileo campanulato obtuso, sicco ochraceo, lamellis adnatis demum umbrinno-ferrugineis, stipite longo glabro", "inter folia Abietis". Høiland (1978) considered *Naucoria tenax* (Fr.) Rick. sensu Rick. as synonym of *Psilocybe rhombispora* (Britz.) Sacc. (= *P. phyllogena*).

Psilocybe testaceo-fulva (Britz.) Sacc., *Syll. Fung.* 5: 1049, 1887. No material studied.

Psilocybe togoënsis P. Henn., in Engler's *Bot. Jahr.* 14: 353, 1891. Species described from Africa. Type not studied (it is not at B). According to Hennings (1891) it is close to *P. cernua* and *P. spadicea*.

Psilocybe torpens (Fr.) Pereira-Coutinho, *Bol. Soc. Bot.* 7: 340, 1931. This is probably a species of *Psathyrella*.

Psilocybe tristis P. Henn., *Hedwigia* 40: 330, 1901. Species described from India. Type not studied.

Psilocybe umbrospora Vel., *Opera Bot. Cechica* 6: 225, 1948. This species was described first by Velenovsky (1921) in Czecho-Slovak language. Pilát (1948) described it in Latin. According to Velenovsky it is close to *P. coprophila* and *Naucoria tabacina*. No material was found at PRM Herbarium.

Psilocybe utricicola (B. & Br.) P. Henn., in Engler & Prantl. *Natür. Pfl. Fam.* 1 (1**): 235, 1900. No material studied.

Psilocybe valdiviensis Sing., *Nova Hedwigia* 29, p. 251, 1969. Species described from Chile, but the type was not found at BAFC, LIL and SGO by the author.

Psilocybe vanhoeflenii (P. Henn.) Sacc., *Syll. Fung.* 21: 219, 1912. Species described in 1906 from New Amsterdam Island in the Southern Indian Ocean. No material studied.

Geophila (*Psilocybe*) *velifera* Favre, *Champ. sup. zone alpine, Parc. Nat. Suisse V* (33): 204, 1955. Species described from Switzerland but unfortunately no material was studied by the author. It seems close to *P. inquilina* (Pers. ex Fr.) Bres. with spores (6.5-)7-8 (-8.5) $\times$ 4.5-5 $\times$ 4-5 μ m.

Psilocybe ventricosa (Bull. ex Fr.) Kumm., *Führ. Pilzk.*, p. 71, 1871. No material studied. Fries (1821-1832) described this species as growing on rich soil.

Psilocybe vernalis Vel., *Opera Bot. Cechica* 6: 225, 1948. This species was described first by Velenovský (1921) in Czecho-Slovak language. Pilát (1948) described it in Latin. No material was found in PRM Herbarium.

Psilocybe vicina (Fr.) Sacc., *Syll. Fung.* 5: 1056, 1887. No material studied.

Psilocybe virescens Mass., *Brit. Fungus Fl.* p. 367, 1892. Synonymous with *Agaricus* (*Psilocybe*) *areolatus* var. *virescens* Cooke & Mass., in Cooke (1871), and *Psilocybe areolatus* var. *virescens* Cooke & Mass., in Cooke (1881-1891). It is probably a species of *Psathyrella*. The color plate 1177 of Cooke (1881-1891) resembles a fungus similar to a *Psathyrella*. Massee (1892) described this fungus from England, on rotten wood, and he wrote: "Quite distinct from *P. areolata* in being solitary and not fasciculate". Konrad & Maublanc (1924-1937) considered *P. virescens* as a species "peu connue ou douteuse".

Psilocybe zonalis Vel., *Opera Bot. Cechica* 6: 226, 1948. This species was described first by Velenovský (1921) in Czecho-Slovak language. Pilát (1948) described it in Latin. According to both description it is close to *P. foeniculii*. No material was found at PRM Herbarium.

3. Excluded species

Deconica acutiuscula Sing. A synonym of *Kuehneromyces vernalis* (Peck) Sing. & Smith, according to Singer & Smith (1946b). This is an inedit name, base on material collected by Singer & Freindling in the U.S.S.R. and deposited at LE.

Psilocybe aequatoriae Sing., *Nova Hedwigia* 29: 59, 1977. This species has chrysocystidia according to the description (Singer, 1977), thus Guzmán (1980) considered it as *Naematoloma aequatoriae* (Sing.) Guzmán.

Psilocybe agrariella Atk., *Ann. Myc.* 7: 374, 1909. It is actually *Psathyrella agrariella* (Atk.) Smith, *North Amer. Psathyrella*, p. 411, 1972. Type at CUP studied.

Psilocybe alachuana Murr., *Lloydia* 5: 155, 1942. It is *Simocybe alachuana* (Murr.) Sing., *The Agaricales in modern tax.*, p. 588, 1962. *Naucoria alachuana* Murr. and *Galerina semiglobata* Murr. are synonym of this species (Singer, 1946).

Psilocybe albobrunnea Beeli, *Bull. Jard. Bot. Et. Brox.* 15: 42, 1938. It is *Psathyrella candolleana* (Fr.) Maire, according to the study of the type (at K), from Njala, Sierra Leone, Africa. Pegler (1966a) wrote about the type of *P. albobrunnea*: "The cellular structure of the pileus-surface indicates that this species would be more correctly placed in the genus *Psathyrella*". *P. albobrunnea* possesses all the characters of the subgenus *Hypholoma*, and there can be little doubt that it represents a further synonym of *Psathyrella candolleana* (Fr.) Maire".

Psilocybe aleurita Heim & Remy, *Bull. Soc. Myc. Fr.* 41: 459, 1926. According to Konrad & Maublanc (1924-1937) this is *Panaeolus guttulatus* Bres.

Psilocybe alnetorum (Sing.) Sing., *Mycologia* 51: 583, 1959 (= *Deconica*, Singer, *Lilloa* 25: 332, 1951). This species has chrysocystidia, therefore Guzmán (1980) considers it to be a *Naematoloma alnetorum* (Sing.) Guzmán.

Psilocybe ammophila (Dur. & Lév.) Gill., *Les Hymén.*, p. 587, 1874. It is *Psathyrella ammophila* (Dur. & Lév.) Orton (Singer, 1968).

Psilocybe ammophila var. *ecaudata* Maire, *Bull. Soc. Bot. Fr.* 56: 279, 1909. This is a synonym of *Psathyrella ammophila* (Dur. & Lév.) Orton, according to Kits van Waveren (1977).

Psilocybe antillarum (Fr.) Sacc., *Syll. Fung.* 5: 1052, 1887. This is obviously a synonym of *Panaeolus antillarum* (Fr.) Dennis, *Kew Bull.* 15: 124, 1961 (= *Anelaria sepulchralis* (Berk.) Sing.; = *Panaeolus solidipes* Peck).

Psilocybe arenulina (Peck) Sacc., *Syll. Fung.* 5: 1057, 1887. It is more correctly *Psathyrella arenulina* (Peck) Smith, *North Amer. Psathyrella*, p. 276, 1972. Type at NYS studied.

Psilocybe areolata (Kl.) Sacc., *Syll. Fung.* 5: 1057, 1887. This is *Psathyrella velutina* (Pers. ex Fr.) Sing., according to Reid & Austwick (1963). Type at K studied. However Boudier's specimens (at PC) are *Panaeolus antillarum* (Fr.) Dennis. On the other hand, *P. areolata* var. *virescens* Cooke & Mass. is a doubtful variety.

Psilocybe asperospora Clel., *Trans. Proc. Roy. Soc. South Austr.* 58: 212, 1934. Guzmán & Watling (1978) considered this fungus as either species of *Panaeolina* or *Psathyrella*, but no type was found to study. - However, more late Watling (1979) considered Cleland's species as *Lacrymaria asperospora* (Clel.) Watling based on three collections made by him in New South Wales (Australia) which about him fitted Cleland's description. This species is close to *Psathyrella velutina* (Fr.) Sing. and *P. sepulchralis* Sing., Smith & Guzmán (this latter known only from Mexico), both considered by Watling as *Lacrymaria*.

Psilocybe atomantoides (Peck) Sacc., *Syll. Fung.* 5: 1048, 1887. It is *Psathyrella atomantoides* (Peck) Smith, *North Amer. Psathyrella*, p. 425, 1972. Type at NYS studied.

Psilocybe bifrons (Berk.) P. Henn., in Engler & Prantl, *Natür. Pfl. Fam.* 1 (1**): 235, 1900. It is *Psathyrella bifrons* (Berk.) Smith, *Contr. Univ. Mich. Herb.* 5: 40, 1941. See also Kits van Waveren (1976).

Psilocybe bipellis (Quél.) Pereira-Coutinho, *Bol. Soc. Brot.* 7: 340, 1931. This is *Psathyrella bipellis* (Quél.) Smith (Dennis *et al.*, 1974), or about Kühner & Romagnesi (1953) is *Drosophila bibellis* (Quél.) K. & R.

Psilocybe caespitosa (Berk.) Sacc., *Syll. Fung.* 5: 1053, 1887. According to the study of the type at UPS (Herb. Fries) and an isotype at K this is a *Psathyrella* sp., with spores, 5-6 × 3.3-4 µm.

Psilocybe camptopoda (Peck) Sacc., *Syll. Fung.* 5: 1057, 1887. This is *Psathyrella camptopoda* (Peck) Smith, *North Amer. Psathyrella*, p. 245, 1972. Type at NYS studied.

Psilocybe canoruber (B. & Br.) Sacc., *Syll. Fung.* 5: 1052, 1887. According to Pegler & Rayner (1969) this is a synonym of *Agaricus aphitochrous* B. & Br., *Jour. Linn. Soc. Bot.* 11: 511, 1871.

Psilocybe caricicola Orton, *Not. Royal Bot. Gard.* 29: 119, 1969. This is *Melanotus caricicola* (Orton) Guzmán, *Mycotaxon* 6: 468, 1978, according to a study of the type: Orton 3083 at E.

Psilocybe castaneicolor Murr., *Mycologia* 15: 19, 1923. This is *Psathyrella conopilus* (Fr.) Pearson & Dennis, *Trans. Brit. Myc. Soc.* 31: 185, 1948 (see Kits van Waveren, 1977, and Smith, 1972).

Psilocybe castaneifolia Murr., *Mycologia* 15: 17, 1923. It is *Psathyrella castaneifolia* (Murr.) Smith, *North Amer. Psathyrella*, p. 33, 1972, or *Panaeolus castaneifolius* (Murr.) Smith, *Mycologia* 40: 685, 1948.

Psilocybe catervata Mass., *Brit. Fung., Fl.* 1: 378, 1892. This is *Psathyrella caterata* (Mass.) Orton, *Trans. Brit. Myc. Soc.* 32: 270, 1949.

Psilocybe cernua (Vahl ex Fr.) Quél., *Champ. Jura et Vosges*, p. 147, 1872. According to Moser (1953) this is *Psathyrella cernua* (Vahl ex Fr.) Moser. But according to Lange (1939) the fungus of the Coker's iconography (1881-1891), pl. 574, as *Agaricus (Psilocybe) cernuus* Fl. Dan. is *Psathyrella lactea* Lange.

Psilocybe chondroderma (B. & Br.) Sacc., *Syll. Fung.* 5: 1048, 1887. This is *Psathyrella chondroderma* (B. & Br.) Smith, *Contr. Univ. Mich. Herb.* 5: 43, 194 (Smith, 1972). Lange (1939) considered *P. chondroderma* as *Hypholoma chondroderma* (B. & Br.) Lange.

Psilocybe citrina Mass. *Kew Bull.* 1901, p. 162, 1901. According to the study of the type at K this is a *Psathyrella* sp. Massee (1901) described this fungus from the Gold Coast (Africa) and was characterized by the clear citron yellow color of the pileus and stipe.

Psilocybe clivensis (B. & Br.) Mass., *Brit. Fung. Fl.* 1: 378, 1872. This is *Psathyrella clivensis* (B. & Br.) Orton, but not sensu Smith (1972) (see Kits van Waveren, 1977b).

Psilocybe cokeriana Smith & Hesler, *Jour. Elisha Mitch. Sc. Soc.* 62: 193, 1946. Following the new concept of the genus *Psilocybe*, this is *Naematoloma cokeriana* (Smith & Hesler) Guzmán for its chrysocystidia (Guzmán 1980).

Psilocybe cokerii Murr., *Mycologia* 15: 12, 1923. It is *Psathyrella cokerii* (Murr.) Smith, *North Amer. Psathyrella*, p. 405, 1972. Type at NY studied.

Psilocybe conissans (Peck) Peck, *Bull. N.Y. State Mus.* 122: 132, 1908. This *Psathyrella conissans* (Peck) Smith, *North Amer. Psathyrella*, p. 243, 1972. Type at NYS studied. Peck (1888) described this fungus as *Clitopilus conissans* Peck.

Psilocybe cystidiosa Peck, *Bull. N.Y. State Mus.* 167: 46, 1913. It is *Psathyrella cystidiosa* (Peck) Smith, *North Amer. Psathyrella*, p. 250, 1972. Type at NYS studied.

Psilocybe dichroma (B. & C.) Sacc., *Syll. Fung.* 5: 1057, 1887. This is *Psathyrella dichroma* (B. & C.) Smith, *North Amer. Psathyrella*, p. 290, 1972. Type at FH (isotype at PC) studied. Berkeley & Curtis (1868) described this fungus as *Agarius (Psilocybe) dichromus* from Cuba.

Psilocybe dispersa (Fr.) Heim, *Champ. Euro.* 2, p. 465, 1958. A synonym of *Naematoloma dispersum* (Fr.) Karst.

Psilocybe elongata (Pers.) Sacc., *Syll. Fung.* 5: 1046, 1887. This is *Naematoloma elongatum* (Pers. ex Fr.) Konr., *Bull. Soc. Linn. Lyon* 8: 135, 1929. Several authors considered this fungus to be *Psilocybe uda* var. *elongata* Pers. (see *P. uda*).

Psilocybe elongatipes (Peck) Sacc., *Syll. Fung.* 5: 1046, 1887. According to Singer (1975) this is *Naematoloma elongatipes* (Peck) Sing., but initially (Singer, 1940) considered it a synonym of *Naematoloma udum* (Pers. ex Fr.) Karst.

Psilocybe ericacea (Pers. ex Fr.) Quél., *Champ. Jura et Vosges*, p. 349, 1873. This is *Naematoloma ericaceum* (Pers. ex Fr.) Sing. (see Singer, 1949, Smith, 1951, and Guzmán & Watling, 1978).

Psilocybe fibrillosa (Fr. ex Pers.) P. Henn., in Engler & Prantl, *Natür. Pfl. Fam.* 1 (1**): 235, 1900. This is *Psathyrella fibrillosa* (Fr. ex Pers.) Maire, in Maire & Werner, *Mém. Soc. Sci. Nat. Maroc* 45: 113, 1937 (see Smith, 1972).

Psilocybe flammuliformis Sing., *Nov. Hedwigia* 29: 247, 1969. Based on the study of the type (*Singer M-5523*) from Chile (at BAFC) this is a *Pholiota* sp., subgenus *Flammula* (Fr.) Sing. emend. Smith & Hesler (Smith & Hesler, 1968) because of the orangish-yellow cheilocystidia, the absence of pleurocystidia, and the pale orangish yellow, dextrinoid spores with a very small germ pores. Singer (1969) wrote: "This is a rather tall species which has the appearance of a *Pholiota*". He did not give the color of the spore print. The fruit body of this fungus in fact is very similar to a *Pholiota* sp. because of its the robustness and color, and lignicolous habitat.

Psilocybe floridana Murr., *Proc. Fla. Acad. Sci.* 7: 126, 1944. According to the study of the type at FLAS (Murrill F-19323), this fungus is a *Psathyrella* sp.

Psilocybe foenisecii (Pers. ex Fr.) Quél., *Champ. Jura & Vosges*, p. 117, 1872. Obviously a synonym of *Panaeolus foenisecii* (Pers. ex Fr.) Kühn. (or *Panaeolina*, R. Maire).

Psilocybe fortunata (Cooke) Sacc., *Syll. Fung.* 5: 1056, 1887. This is *Panaeolus antillarum* (Fr.) Dennis, based on the study of the type (*Glaziov 9150*) from Brazil at K. A black & white plate by Cooke at K was also studied.

Psilocybe frustulenta (Fr.) P. Henn., in Engler & Prantl. *Natür. Pfl. Fam.* 1 (1**): 235, 1900. This is *Psathyrella frustulenta* (Fr.) Smith, *Contrib. Univ. Mich. Herb.* 5: 45, 1941.

Psilocybe fuscofolia Peck, *Bull. N.Y. State Mus.* 157: 100, 1912. This is *Psathyrella fuscofolia* (Peck) Smith, *North Amer. Psathyrella*, p. 362, 1972. Type at NYS studied.

Psilocybe gillettii Karst., *Medd. Soc. F. Fl. Fenn.* 5: 32, 1879. This is a *Naematoloma* sp. based on the study of two collections (1521 & 1522) by Karsten (at H), both from Tavastia, and collected by Karsten in 1876 and 1878, respectively. Both collections have typical chrysocystidia (with a refrigent central mass). Karsten (1879) only mentioned the collection on 1878.

Psilocybe glutinosa Vel., in *Herbarium* (Velenovsky, XIV-1934, PR 154374) from Czechoslovakia, is *Galerina* sp., with rough spores.

Psilocybe gossypina (Bull.) P. Henn., in Engler & Prantl. *Natür. Pfl. Fam.* 1 (1**): 235, 1900. It is actually *Psathyrella gossypina* (Bull. ex Fr.) Konrad & Maubl.

Psilocybe hydrophila (Bull. Fr.) Gill., *Les Hymén.*, p. 583, 1874. This is *Psathyrella hydrophila* (Bull. ex Fr.) Maire, *Mém. Soc. Sci. Nat. Maroc* 45: 113, 1937; *P. hydrophyla* (Bull. ex Fr.) Sing. (considered by Singer, 1949) is a synonym. According to Karsten (1879), Massee (1892) and Rea (1922), this is *Psilocybe spadicea* var. *hygrophila* (Bull. ex Fr.) Mass. Lange (1939) considered Bulliard's fungus as *Hypoloma hydrophilum* (Bull.) Quél.

Pholiota johnsoniana (Peck) Atkinson, *Studies Amer. Fungi*, p. 153, 1900. This fungus according to Smith (1979) is a species of *Psilocybe*, even though Smith & Hesler (1968) considered it a *Pholiota* following Atkinson. - Since it has typical chrysocystidia, it is obvious that Peck's species does not belong to *Psilocybe* based

on the concept followed in the present monograph. Peck first in 1872 considered the fungus as *Agaricus johnsonianus* and then in 1888 as *Stropharia johnsoniana*, according to Smith & Hesler (1968).

Psilocybe larga Kauff., *Agar. Mich.*, p. 279, 1918. This is *Psathyrella larga* (Kauff.) Smith, *North Amer. Psathyrella*, p. 125, 1972. Type at MICH studied.

Psilocybe leechii Smith, *Jour. Elisha Mitch. Sci. Soc.* 62: 196, 1946. This is *Agrocybe leechii* (Smith) Watling, *Not. Roy. Bot. Gard.* 34: 250, 1975. Type at MICH studied. The hymeniderm pileus and the large ochraceous spores are typical in this species as Watling (1975) discussed.

Psilocybe limicola (Peck) Sacc., *Syll. Fung.* 5: 1054, 1887. This is *Psathyrella limicola* (Peck) Smith, *North Amer. Psathyrella*, p. 415, 1972. Type at NYS studied. Peck (1872) described this species as *Agaricus (Psilocybe) limicola* Peck.

Psilocybe limophila (Peck) Peck, *N.Y. State Mus. Bull.* 157: 104, 1912. This is *Psathyrella limophila* (Peck) Guzmán, *Mycotaxon* 6: 471, 1978. Type at NYS studied.

Psilocybe longispora Murr., *Jour. Fla. Acad. Sci.* 8: 197, 1945. This is *Naematoloma longispora* (Murr.) Smith, *Mycologia* 43: 480, 1951.

Psilocybe microrrhiza (Lasch) P. Henn., in Engler & Prantl. *Natür. Pfl. Fam.* 1 (1**): 235, 1900. This is *Psathyrella microrrhiza* (Lasch) Konr. & Maubl.

Psilocybe microsperma Speg., *Bol. Ac. Nac. Cienc. Córdoba (Argentina)* 23: 402, 1919. This is *Psathyrella spegazzini* Guzmán, nom. nov., non *Psathyrella microsperma* (Peck) Smith. Type at LPS (16823) from Paraguay (*Leg. Anisitz 410*); the spores are subglobose, thin walled, violaceous brown, (4.5-) 5-6 × (3.5-) 4.5-5 µm. Guzmán in Guzmán & Vergeer (1978) first considered this fungus as *Psathyrella microsperma* (Speg.) Guzmán.

Psilocybe mutabilis Karst., *Symb. Fenn.* 29: 101, 1890. This is *Naematoloma* sp., based on a study of Karsten's material at H. There are typical chrysocystidia; the spores are ellipsoid, dark orange brown, and KOH stains the pileus brownish red. *P. mutabilis* Karst. is not *Kuehneromyces mutabilis* (Fr.) Sing. & Smith (= *Agaricus mutabilis* Schaeff. ex Fr., *Syst. Myc.* 1: 245, 1821) (see Singer & Smith, 1946b and Smith & Hesler, 1968).

Psilocybe myosotis Fr. sensu Lange (1955). It is *Naematoloma myosotis* (Fr.) Smith, *Mycologia* 42: 323, 1950. This species is *Naucoria*, Kummer (1871), *Drosophila*, Kühner & Romagnesi (1953), and *Pholiota*, Singer (1949, 1975). Fries (1821-1832) considered this fungus as *Agaricus myosotis* in the tribu *Psilocybe*. Rick (1967) described this fungus as *Pholiota myosotis* (Fr.) Kühn. & Romag.

Psilocybe naematoliformis Guzmán, *Beih. Sydowia* 8: 172, 1979. For the chrysocystidia this is *Naematoloma naematoliformis* (Guzmán) Guzmán, *Mycotaxon* 12: 236, 1980, of the sect. *Neocaledoniae* (see Guzmán, 1980).

Psilocybe neocaledonica Guzmán & Hora, *Beih. Sydowia* 80: 53, 1978. Following the new concept of the genus, because of the presence of chrysocystidia, this species

- is *Naematoloma neocaledonica* (Guzmán & Horak) Guzmán, *Mycotaxon* 12: 236, 1980 (see Guzmán 1980).
- Psilocybe nolitangere* (Fr.) P. Henn., in Engler & Prantl, *Natür. Pfl. Fam.* 1 (1**): 235, 1900. This is *Psathyrella nolitangere* (Fr.) Pearson & Dennis, *Trans. Brit. Myc. Soc.* 31: 184, 1948.
- Psilocybe obscura* Peck, *Bull. Torr. Bot. Club* 24: 144, 1897. This is *Psathyrella obscura* (Peck) Guzmán, *Mycotaxon* 7: 473, 1978, based on the study of the type (at NYS, Leg. Batholomew).
- Psilocybe obtusata* (Fr.) Kumm., *Führ. Pilzk.* p. 71, 1871. - This is *Psathyrella obtusata* (Fr.) Smith, *Contr. Univ. Mich. Herb.* 5: 55, 1941. Smith (1941a) reported this species from Washington (U.S.A.) but later (1972) he did not consider this species.
- Psilocybe obtusissima* Kauff. & Smith, *Pap. Mich. Acad. Sc. Arts & Lett.* 17: 194, 1932. This is *Naematoloma obtusissima* (Kauff. & Smith) Guzmán, comb. nov. The type (Kauffman 142, at MICH) has mustard brown chrysocystidia, 42-50 × 9-14 µm and spores ellipsoid, 14-18 (-22) × 7-9 µm.
- Psilocybe ochraceps* Kauff., *Pap. Mich. Acad. Sc. Arts & Lett.* 5: 143, 1925. This is *Naematoloma dispersum* (Fr.) Karst., *Bidr. Finl. Nat. Folk.* 32: 496, 1879 (Smith, 1951). Type at MICH studied.
- Psilocybe olivaceotincta* Kauff., *Pap. Mich. Acad. Sci.* 5: 144, 1925. This is *Naematoloma olivaceotinctum* (Kauff.) Smith, *Mycologia* 43: 488, 1951. Type at MICH studied.
- Psilocybe orizabensis* Murr., *Mycologia* 10: 29, 1918. This is *Psathyrella orizabensis* (Murr.) Smith, *North Amer. Psathyrella*, p. 294, 1972. Type at NY (from Mexico) studied.
- Psilocybe palmigena* (B. & C.) Sacc., *Syll. Fung.* 5: 1049, 1887. This is *Psathyrella palmigena* (B. & C.) Guzmán, *Mycotaxon* 7: 473, 1978, based on the study of the type (at FH) and the isotype (at PC), from Cuba. The spores are (5.2-) 6.7-8 × (4-) 4.5-5.5 µm, thin walled, pale grayish violaceous but whitish in H₂SO₄. Singer (1975) considered this species a *Psilocybe*. Berkeley & Curtis (1868) described this species as *Agaricus (Psilocybe) palmigena* from Cuba.
- Psilocybe papyracea* (Bol.) Lange, *Dansk Bot. Arkiv* 9: 32 1936. This is *Psathyrella* sp. according to Bas (pers. com.), but according to Kühner & Romagnesi (1953) this is *Drosophila (Psathyra) cernua* ss. Rick.
- Agaricus pediades* Fries, *Syst. Myc.*, p. 290, 1821, tribu *Psilocybe*. This is *Agrocybe pediades* (Pers. ex Fr.) Fayod ex aut., according to Singer (1975).
- Psilocybe peladae* Sing., *Nova Hedwigia* 29: 254, 1969. A species of *Naematoloma* for the typical chrysocystidia observed in the type *Singer M-6782* (at SGO) from Chile. Singer (1975) considered this species in the Section *Chrysocystidiatae* Sing.
- Psilocybe pennata* (Fr.) Pereira-Coutinho, *Bol. Soc. Brot.* 7: 329, 1931. This is *Psathyrella pennata* (Fr.) Konr. & Maubl. (Singer, 1975).
- Geophila (Psilocybe) phillipsii* (B. & Br.) Kühn. & Romag., *Fl. anal. champ. sup.*, p. 339, 1953. This is a *Melanotus phillipsii* (B. & Br.) Sing., *Sydowia* 7: 84, 1973. Malençon & Bertault (1970) described it as *Geophila*, and Singer (1949) considered it as probably *Pleuroflammula*. Horak (1977) described it as *Melanotus*.
- Psilocybe plana* Rick, *Broteria* 24: 113, 1930. This is *Psathyrella plana* (Rick) Guzmán, *Mycotaxon* 7: 474, 1978, based on the study of the type; PACA 14553 (9326) from Brazil.
- Psilocybe polycephala* (Paul. ex Fr.) Peck, *Bull. N.Y. State Mus.* 157: 55, 1912. This is *Psathyrella polycephala* (Paul. ex Fr.) Smith, *North Amer. Psathyrella*, p. 253, 1972. Peck's material at NYS agrees well with this fungus. Saccardo (1887) considered the fungus as *Psilocybe spadicea* var. *polycephala* (Fr.) Sacc.
- Psilocybe polytrichi* (Fr.) Sacc., *Syll. Fung.* 5: 1046, 1887. It is *Naematoloma polytrichi* (Fr.) Konr., *Bull. Soc. Linn. Lyon* 8: 135, 1929. This position was followed by Smith (1951) and Singer (1975). But Ricken (1915) considered it as *Hypholoma polytrichi* (Fr.) Rick. (following by Dennis *et al.*, 1974), and Gillet (1874-1893) considered it as *Psilocybe uda* var. *polytrichi* Gill. All the Herbarium materials identified as *Psilocybe polytrichi* revised by the author in Europe, belong to *Naematoloma polytrichi*.
- Psilocybe pulicosa* (Mont.) Sacc., *Syll. Fung.* 5: 1056, 1887. This is *Psathyrella pulicosa* (Mont.) Guzmán, *Mycotaxon* 6: 474, 1978, based on the study of the type: Sullivan s.n., Herb. Montagne 314 (at PC), from Ohio, U.S.A.
- Psilocybe rhodophaea* (Mont.) Sacc., *Syll. Fung.* 5: 1050, 1887. This is *Psathyrella rhodophaea* (Mont.) Guzmán, *Mycotaxon* 6: 474, 1978, based on the study of the type: Sullivan s.n. Herb. Montagne 166 (at PC) from Ohio, - U.S.A. Melendez-Howell (1967) studied the spores of the type with a electron microscope. Murrill (1923) considered it as *Psilocybe*.
- Psilocybe sabulicola* Speg. Type at LPS (16824). It seems not to be described. A microscopic study reveals that this is *Psathyrella* sp.
- Psilocybe sarcocephala* (Fr.) Gill., *Les Hymén.*, p. 586, 1874. This is *Psathyrella sarcocephala* (Fr.) Sing.
- Psilocybe scobicola* (B. & Br.) Sacc., *Syll. Fung.* 5: 1048, 1887. This is *Naematoloma scobicola* (B. & Br.) Guzmán, *Mycotaxon* 6: 474, 1978, based on the study of the type (at K). The chrysocystidia are typical. Berkeley & Broome (1837-1885) described this fungus from England, on sawdust. Quélet & Maire (see Pearson, 1935) considered *Agaricus scobiculus* as *Hypholoma appendiculatus* and *H. candolle-anum* form, respectively. - According to Pearson & Dennis (1948) the pl. 598 (607) of Cooke (1881-1891) looks like *Hypholoma candolle-anum*.
- Psilocybe semivestita* (B. & Br.) P. Henn., in Engler & Prantl, *Natür. Pfl. Fam.* 1 (1**): 235, 1900. This is *Psathyrella semivestita* (B. & Br.) Smith, *Contrib. Univ. Mich. Herb.* 5: 57, 1941.
- Psilocybe senex* Peck, *Ann. Rep. N.Y. State Mus.* 41: 70, 1888. This is *Psathyrella senex* (Peck) Smith, *North Amer. Psathyrella*, p. 230, 1972. Type at NYS studied.

Deconica sordida (Speg.) Sing., *Lilloa* 23: 214, 1950. Spegazzini (1889) described this fungus from Brazil as *Flammula sordida* Speg., *Bol. Acad. Nac. Cienc. Córdoba* 11: 417, 1889. The study of the type (LBS 37611, *Leg. Puiggari*) shows a fungus with spores 9-11 (-13.2) $\times$ 7-9 μ m, thick walled, lacking pleurocystidia, with long rhizomorphs at the base of the stipe, subumbonate, pale brownish orange pileus, and with globose hyaline cells in the pileus. All these feature agree with a species of *Agrocybe*, possibly a no described species.

Psilocybe spadicea (Schaeff. ex Fr.) Kumm., *Führ. Pilzk.*, p. 71, 1871. This is *Psathyrella spadicea* (Schaeff. ex Fr.) Sing., *Lilloa* 22: 468, 1951, a very widespread fungus in temperate zones (see Smith, 1972).

Psilocybe spadicea var. *hygrophila* (Fr.) Karsten, *Hattsvamp*. p. 506, 1879. See *P. hidrophyla*.

Psilocybe spadica var. *polycephala* (Schaeff. ex Fr.) Sacc., *Syll. Fung.* 5: 1053, 1887. It is a synonymy of *Psathyrella polycephala* (Fr.) Smith, *North Amer. Psathyrella*, p. 253, 1972.

Psilocybe spadiceo-grisea (Schaeff. ex Fr.) Bound., *Icon. Mic.* 4: 68, 1905. This is *Psathyrella spadiceo-grisea* (Schaeff. ex Fr.) Maire, *Mém. Soc. Sci. Nat. Maroc* 45: 113, 1937 (see Smith, 1972).

Deconica sphagnum Darimont. This is a *Naematoloma* sp. based in the studied material: *Darimont 1377* (19-IX-1942), collected on *Sphagnum*, in Vecquées, Seraing, Prov. Liege, Belgique (at LG). It has typical chrysocystidia, and seems not be a described species.

Psilocybe squalidella (Peck) Peck, *Ann. Rep. N.Y. State Mus.* 46: 55, 1893. This is *Naematoloma squalidellum* (Peck) Smith, *Mycologia* 43: 493, 1951, following Parker (1933). Type at NYS studied; it has typical chrysocystidia. However, Heim (in Heim & Wasson, 1958) supposed that *Psilocybe mexicana* Heim is related to with Peck's species.

Psilocybe squalidella var. *caespitosa* Peck, *Ann. Rep. N.Y. State Mus.* 59: 55, 1906. A synonym of *Naematoloma squalidellum* (Peck) Smith, *Mycologia* 43: 493, 1951. - Type at NYS studied.

Psilocybe squalidella var. *deformata* Peck, *Ann. N.Y. State Mus.* 157: 98, 1912. According to Smith (1951) this is a synonym of *Naematoloma udum* (Pers. ex Fr.) Karst. - Type at NYS studied.

Psilocybe squalidella var. *macrosperma* Peck, *Ann. N.Y. State Mus.* 157: 98, 1912. The same position and observation for that of var. *deformata* (see that).

Psilocybe squalidella var. *umbonatus* Peck, *Ann. N.Y. State Mus.* 157: 98, 1912. This is a synonym of *Naematoloma squalidellum* (Peck) Smith, based on the study of the type at NYS.

Psilocybe stagnina (Fr.) Lange, *Medd. Grönl.* 148: 65, 1957. This is *Galerina stagnina* (Fr.) Kühn., *Ency. Myc.* 7: 187, 1935, according to Smith & Singer (1964), but later was considered as *Phaeogaleria stagnina* (Fr.) Kühn. by Kühner (1972).

Psilocybe stercicola Clél., *Trans. & Proc. Royal Soc. South Austr.* 51: 305, 1927. According to the study of the type at AD, from Australia, reveals that this fimicolous species is close to the genera *Naematoloma* or *Stropharia* because of the chrysocystidia present.

Agaricus (Psilocybe) stercorarius Fr., *Syst. Myc.* 1, p. 291, 1821. This is *Stropharia stercoria* (Bull. ex Fr.) Quél., according to several authors such as Imai (1938), Singer (1975), and others. Pearson & Dennis (1948) considered "*Stropharia stercoria* Fr." as synonym of *S. semiglobata* (Batsch ex Fr.) Quél.

Psilocybe subagraria Atk., *Ann. Mycol.* 7: 375, 1909. This is *Psathyrella subagraria* (Atk.) Smith, *North Amer. Psathyrella*, p. 126, 1972. Type at CUP studied.

Psilocybe subammophila Clél., *Trans. & Proc. Roy. Soc. South Austr.* 51: 306, 1927. This is *Psathyrella ammophila* (Dur. & Lév.) Orton, following Kits van Waveren (1977).

Psilocybe subericacea (Fr.) Sacc., *Syll. Fung.* 5: 1045, 1887. This *Naematoloma subericaceum* (Fr.) Sing. (Singer, 1975).

Psilocybe submaculata Atk., *Ann. Myc.* 7: 375, 1909. This is *Psathyrella submaculata* (Atk.) Smith, *North Amer. Psathyrella*, p. 252, 1972. Type at CUP (Isotype at BPI) studied.

Psilocybe subviridis (B. & C.) Sacc., *Syll. Fung.* 5: 1051, 1887. This is *Naematoloma subviride* (B. & C.) Smith, *Mycologia* 43: 519, 1951. Type at FH (Isotype at PC and LPS); Wright 76 studied. Berkeley & Curtis (1868) described this fungus as *Agaricus (Psilocybe) subviride* from Cuba.

Psilocybe sullivantii (Mont.) Sacc., *Syll. Fung.* 5: 1047, 1887. This is *Psathyrella sullivantii* (Mont.) Guzmán, *Mycotaxon* 6: 475, 1978, based on the study of the type (*Sullivant 258*, from Ohio, U.S.A., at PC). It is close to *Psathyrella velutina* (Fr.) Sing., but with smooth spores (6.7-) 7.5-9 (-10.5) $\times$ 4.5-5.2 (-6) μ m.

Psilocybe taediosa (Kalchbr.) Sacc., *Syll. Fung.* 5: 1044, 1887. This species was described by Kalchbrenner (in Kalchbrenner & Cooke, 1880-1881) from Inanda, South Africa as *Agaricus (Psilocybe) taediosa* Kalchbr. The study of the type by Reid (1975) showed that this fungus has chrysocystidia, then belongs to *Stropharia* as Reid considered: *S. taediosa* (Kalchbr.) Reid.

Deconica tenerrima Wichansky. Probably to be a *nomen nudum* because it seems no described. The type in PR is actually *Panaeolus subbalteatus* (Berk. & Br.) Sacc.

Psilocybe tibetensis Mass., *Bull. Misc. Inf. Kew* 4: 93, 1906. A study of the type (*Kings 167* (at K) from Tibet) shows this is *Agrocybe tibetensis* (Mass.) Guzmán, *Mycotaxon* 6: 475, 1978. It has spores thick walled, ellipsoid, brownish, 12-15.4 $\times$ 7.7-8.8 (-11) μ m.

Psilocybe tomentosa (Murr.) Smith, *Mycologia* 40: 705, 1948. Murrill (1922 b) described this fungus as *Deconica tomentosa* Murr. from Alabama, U.S.A., but a study of the type (*Earle 11* at NY) shows is *Phaeomarasmius* sp. because of the pilocystidia (reported by Smith, 1948), which have incrustated ochraceous pigment and more or less chains of globose cells below.

Psilocybe tortipes Speg., *An. Mus. Nac. Buenos Aires* 6: 151, 1898. This is *Naematoloma tortipes* (Speg.) Guzmán, *Mycotaxon* 6: 476, 1978, based on the study of the type (Spegazzini s.n. 1-1888, at LPS 16820, from Argentina). It has spores 12-18 (-19) × (6-) 9.7-15 µm and chrysocystidia 20-45 × 5-15 µm. But *P. tortipes* sensu Rick after a study of the material: *Rick 179* at PACA (14560) in FH, PC, BPI and NY, is another species of *Naematoloma* or *Stropharia* with chrysocystidia and spores 10.5-13 (-15) × 6-7.5 µm. Another collection of *Psilocybe tortipes* studied by Spegazzini (LPS 16821) is a *Panaeolus* sp. (see Guzmán, 1978 a).

Psilocybe tortipes sensu Rick, see discussion of *P. tortipes* Speg.

Psilocybe tropicalis Speg., *Bol. Acad. Nac. Cienc. Córdoba (Argentina)* 11: 381, 1891. This is *Agrocybe tropicalis* (Speg.) Guzmán, *Mycotaxon* 6: 476, 1978, based in the study of the type (Spegazzini 2911, at LPS 38306, from Brazil). The fruit body is similar to *Agrocybe semiorbicularis* (Bull. ex Fr.) Fayod, with subrhomboid thick walled spores, (8.4-) 9.6-12 (-14.4) × (7.2-) 8.4-9.6 × 4-6 µm, and a pileus with globose hymeniform cells.

Psilocybe tuberosa (Karst.) Sacc., *Syll. Fung.* 17: 90, 1905. This is a species of *Psathyrella*, based in the study of the type (Oksanew & Lönnbom, Jun. 1902) from U.S.S.R., at Karsten Herbarium at H.

Psilocybe uda (Pers. ex Fr.) Gill., *Les Hymén.*, p. 586, 1878. This is *Naematoloma udum* (Pers. ex Fr.) Karst., *Bidr. Finl. Nat. Folk.* 32: 497, 1879, because of the chrysocystidia and the habitat (on *Sphagnum*) but *Psilocybe uda* sensu Sing. *Lilloa* 24: 13, 1953 is *Psilocybe paupera* Sing., of the Section *Subaeruginosae* Guzmán (see also Singer, 1953) (see discussion of *P. elongatipes* (Peck) Sacc.)

Psilocybe uda var. *elongata* (Pers.) ex auct. is obviously a synonym of *Naematoloma elongatum* (Pers. ex Fr.) Konr. (see *Psilocybe elongata*).

Psilocybe uda var. *polytrichi* Gill., *Les Hymén.*, p. 586, 1878 (see *P. polytrichi*).

Psilocybe uda var. *sphagnicola* Lange, *Dan. Bot. Ark.* 9: 29, 1936. Surely this is a synonym of *Naematoloma udum* (Pers. ex Fr.) Karst., because Lange (1936) based this taxon only in a fruit body with slender stem and sphagnicolous habitat.

Psilocybe unicolor Peck, *Ann. Rep. N.Y. State Mus.* 53: 845, 1900. This is *Psathyrella camptopoda* (Peck) Smith, following Murrill's concept (1923) and based in the study of the type (at NYS). But Smith (1972) did not mention Peck's species.

Psilocybe vialis Murr., *Mycologia* 15: 11, 1923. This is *Naematoloma vialis* (Murr.) Guzmán, *Mycotaxon* 7: 476, 1978. The type: *Earle 725* (at NY) has chrysocystidia with a refringent central hyaline or yellow body. However, Smith (1948) noted that "The pleurocystidia are not those of *Naematoloma*". He described brownish pleurocystidia with a granular content or some with a highly refractive amorphous substance.

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<i>uda</i> (sensu Rick) = <i>P. paupera</i>	102
<i>umbonatus</i> (var., <i>P. squalidella</i>) = <i>Naematoloma</i> <i>squalidellum</i>	418
<i>umbonatescens</i> (<i>Stropharia</i>) = <i>P. luteonitens</i>	314
<i>umbrophila</i> (var., <i>P. caerulescens</i>) = <i>P. caerulescens</i> var. <i>ombrophila</i>	115
<i>umbrospora</i> doubtf. sp.....	410
<i>unicolor</i> = <i>Psathyrella campelopoda</i>	420
<i>urticola</i> doubtf. sp.....	410
<i>uruguayensis</i>	220
<i>uxpanapensis</i>	96
<i>vaccinii</i> (var., <i>P. agrariella</i>) doubtf. sp.....	399
<i>valdiviensis</i> doubtf. sp.....	410
<i>vanhoeftenii</i> doubtf. sp.....	410

<i>velifera</i> (<i>Geophila</i>) doubtf. sp.....	410
<i>venenata</i>	369
<i>ventricosa</i> Bull. ex Fr. doubtf. sp.....	410
<i>ventricosa</i> Mass. (<i>Stropharia</i>) = <i>P. moellerii</i>	238
<i>venezuelana</i>	286
<i>veraecrucis</i>	97
<i>vernalis</i> doubtf. sp.....	410
<i>vialis</i> = <i>Naematoloma vialis</i>	420
<i>vicina</i> doubtf. sp.....	410
<i>virescens</i> doubtf. sp.....	410
<i>virescens</i> (var., <i>P. areolata</i>) doubtf. sp.....	400
<i>vomiticola</i> (var., <i>P. coprophila</i>) doubtf. sp.....	402
<i>washingtonensis</i>	286
<i>wassonii</i> = <i>P. muliercula</i>	260
<i>wassoniorum</i>	146
<i>weldenii</i>	98
<i>wrightii</i>	147
<i>xalapensis</i>	149
<i>xeroderma</i>	197
<i>yungensis</i>	150
<i>zapotecorum</i>	266
<i>zapotecorum</i> (sensu Sing.) = <i>P. hoogshagenii</i>	129
<i>zonalis</i> doubtf. sp.....	410

Explanation of the Plates

Due to technical reasons the coloured plates (2, 3, 7, 8, 58, 59, 60, 61, 62, 63, 64, 65, 66 and 67) had to be placed at the very end of the book.

Colour plates

Plate 2 (color): *Psilocybe pelliculosa* Singer & Smith a very common hallucinogenic species in the Pacific Northwest of North America (Photo. Bigwood).

Plate 3 (color): *Psilocybe caerulescens* Murr. var. *caerulescens* is the first hallucinogenic mushroom known in America. It is common through Mississippi (U.S.A.) to Venezuela (Photo. Jacobs).

Plate 7 (color): *Psilocybe stuntzii* Guzmán & Ott (old specimens without annulus). This fungus is one of the most important psicotropic species in the Pacific Northwest of North America (Photo. Bigwood).

Plate 8 (color): *Psilocybe cyaneoscens* Wakef. an European hallucinogenic species, but also widespread in the Pacific Northwest of U.S.A. and Canada (Photo. Bigwood).

Plate 41: *Electron microscopic studies* (I) Figs. 635-639: *Psilocybe cubensis*, 635: Cheilocystidia and trama. 636-638: Cheilocystidia (note in 636-637 the filamentous prolongation of the head). 639: Clamp connection (all by Stamets).

Plate 42 *Electron microscopic studies* (II): Figs. 640-641. - *Psilocybe cyaneoscens* and *P. baeocystis*. 640: *P. cyaneoscens*, pleurocystidia and basidia (note the globose head of the pleurocystidia and the four spored basidia). 641: *P. baeocystis*, the edge gill covered by cheilocystidia, and the hymenium (below) with four spores basidia (all by Stamets).

Plate 43 *Electron microscopic studies* (III): Figs. 642-643. - *Psilocybe baeocystis* and *P. pelliculosa*, 642: *P. baeocystis*, cheilocystidia and one spore. 643: *P. pelliculosa*, pleurocystidia and basidia (a view close to the edge gill) (all by Stamets).

Plate 44 *Electron microscopic studies* (IV): Figs. 644-645: *Psilocybe pelliculosa*, 644: a subpyriform basidium showing the thin wall and four sterigmata. 645: Hymenium with many four spored basidia (all by Stamets).

Plate 45 *Electron microscopic studies* (V): Figs. 646-647: *Psilocybe pelliculosa*, 646: Spores showing the broad germ pore. 647: The four spores in the basidia (all by Stamets).

Plate 46 *Electron microscopic studies* (VI) (see also plate 68): Figs. 648-649: *Psilocybe pelliculosa*, cheilocystidia (note in 649 the drop at the apex, solid and verrucose for the microscopic techniques) (all by Stamets).

Plate 47: Figs. 650-656. - Several species of *Psilocybe*. 650: *P. wrightii* (type). 651: *P. mexicana* (Guzmán 1133, growing on soil inside of an old corn plantation). 652: *P. herrerae* (type), 653: *P. coprophila* (Guzmán 5934 on horse dung). 654: *P. caerulescens* var. *caerulescens* (Guzmán 1457). 655: *P. mexicana* (Guzmán 983 on a meadow). 656: *P. mexicana* (Guzmán 900).

Plate 48: Figs. 657-662. - Several species of *Psilocybe*. 657: *P. brasiliensis* (type) (note the leaves of the grass *Axonopus compressus* attached to the stipe). 658-662: *P. caerulescens* var. *caerulescens* (658: Guzmán 2323; 659: Guzmán 1457; 660 & 661: Guzmán 924; 662: Guzmán 1903) (note in 600 & 661 that is growing on argillaceous soil close together to cane sugar plants, but not on these plants).

Plate 49: Figs. 663-669. - Several species of *Psilocybe*. 663: *P. pintonii* (type). 664: *P. uxpanapensis* (type). 665: *P. hoogshagenii* var. *hoogshagenii* (Guzmán 1577). 666: *P. physaloides* (Lundell 1149). 667: *P. heimii* (Guzmán 1919). 668-669: *P. muliercula* (Guzmán 1648 on muddy soil without herbaceous vegetation in a ravine; and Guzmán 1743A in a very rare case, between mosses, respectively).

Plate 50: Figs. 670-676. - Several species *Psilocybe*. 670: *P. columbiana* (type). 671: *P. tampanensis* (cultures made by Pollock). 672: *P. zapotecorum* (anonymous). 673: *P. zapotecorum* (type of *P. candidipes*) (photo. Singer). 674-675: *P. montana* (674: Smith 1184; 675: Smith 67834, both photos. Smith). 676: *P. weldenii* (Guzmán 17498).

Plate 51: Figs. 677-681. - Several species of *Psilocybe*. 677: *P. stuntzii* (Gerrish, Nov. 75, photo. Gerrish). 678: *P. merdaria* (Smith 27735, photo. Smith) (on rich soil with humus and dung). 679: *P. coprophila* (Guzmán 16327 on dung). 680: *P. stuntzii* (Guzmán 16613). 681: *P. squamosa* var. *squamosa* (Smith 31687a, photo. Smith).

Plate 52: Figs. 682-685. - *Psilocybe subcubensis* and *P. argentina*. 682-684: *P. subcubensis* (682: Guzmán 870 cultures on cow dung; 683-684: Guzmán 16328). 685: *P. argentina* (Guzmán 1675, growing on cow dung in a high mountain of Mexico).

Plate 53: Figs. 686-691. - Several species of *Psilocybe*. 686: *P. argentina* (type of *P. merdicola*). 687: *P. atrobrunnea* (Smith 11029, photo. Smith). 688-689: *P. laticystis* (688: Smith 71298; 689: Smith 73670, both photos. Smith). 690: *P. subborealis* (Smith 54068, photo. Smith). 691: *P. physaloides* (Leslie 4236, photo. Leslie).

Plate 54: Figs. 692-696. - *Psilocybe aztecorum*. 692: *P. aztecorum* var. *aztecorum* (Guzmán 16557 on humus and wood debris). 693: *P. aztecorum* var. *bonetii* (López González 301, note the humus). - 694-696: *P. aztecorum* var. *aztecorum* (694: Camacho 50; 695: Guzmán 1099 on humus with *Alchemilla procumbens*; 696: Guzmán 16551) (695 photo. Herrera).

Plate 55: Figs. 697-702. - Several species of *Psilocybe*. 697: *P. caerulipes* (Smith 37428, photo Smith). 698: *P. pelliculosa* (Smith 9370, photo Smith). 699: *P. callosa* (Huijsman, L - 3915-1). 700: *P. baecystis* (Smith 24403 as *P. strictipes* by Smith at MICH, photo. Smith). 701: *P. semilanceata* (Lundell 1148). 702: *P. plutonia* (type).

Plate 56: Figs. 703-705. - Habitat of *Psilocybe*. 703: *P. aztecorum* var. *aztecorum*, a grassland in an open forest of *Pinus hartwegii* in the high mountains of Mexico. 704: *P. wrightii*, a grassland with shrubs close to the subtropical forest, in Tucuman zone (Argentina). 705: *P. brasiliensis*, open forest of *Araucaria brasiliana* and *Podocarpus* with the grass *Axonopus compressus*.

Plate 57: Figs. 706-708. - Habitat of *Psilocybe*. 706: Meadows where *P. cubensis* and *P. subcubensis* grow in the subtropical region. 707: Subtropical or deciduous forest, also known as Mountain Mesophilous forest in Mexico (in Huautla de Jiménez region), where *Psilocybe zapotecorum*, *P. heimii*, *P. yungensis*, *P. cordispora* and others grow, also in coffee plantations. In those meadows (in the middle of the photo) *P. mexicana* is very common. The two trees in front on the right are *Platanus lindeniana* and those of the hill *Liquidambar styraciflua*, *Quercus* spp. and others. 708: Habitat of *P. muliercula*, walls of the ravines with muddy soil without any herbaceous vegetation in *Abies* forests (high mountain of Mexico). This habitat is similar to that of *P. hoogshagenii* var. *hoogshagenii* in the deciduous forests in Mexico and to that of *P. columbiana* in the high mountains - vegetations (or "páramos") of Colombia.

Plate 58: Figs. 709-714. - Several species of *Psilocybe*. 709: *P. veraecrusis* (Guzmán 17433-A). 710-711: *P. clavatum* (type) (photos. Jacobs). 712: *P. fagicola* var. *fagicola* (Guzmán 2679). 713: *P. muliercula* (Guzmán 1648). 714: *P. weldenii* (Jacobs 40) (photo. Jacobs).

Plate 59: Figs. 715-721. - Several species of *Psilocybe*. 715-716: *P. caerulescens* var. *ombrophila* (Jacobs 42 & 48, respectively) (photos. Jacobs). 717: *P. caerulescens* var. *caerulescens* (Singer M-1513 and Guzmán 915) (photo. Singer). *P. armandii* (Jacobs 6) (photo. Jacobs). 719: *P. hoogshagenii* var. *hoogshagenii* (Jacobs 41) (photo. Jacobs). 720: *P. jacobsonii* (type) (photo. Jacobs). 721: *P. hoogshagenii* var. *covexa* (Guzmán 2118).

Plate 60: Figs. 722-728. - Several species of *Psilocybe*. 722-724: *P. yungensis* (Jacobs 51) (photos. Jacobs). 725: *P. stuntzii* (Guzmán 16649). 726: *P. herrerae* (Jacobs 70) (photo. Jacobs). 727-728: *P. stuntzii* (photo. Leslie).

Plate 61: Figs. 729-734. - Several species of *Psilocybe*. 729: *P. columbiana* (type). 730-731: *P. pintonii* (type). 732: *P. columbiana* (type). 733: *P. baecystis* (Guzmán 16620). 734: *P. brasiliensis* (type).

Plate 62: Figs. 735-740. - Several species of *Psilocybe*. 735-736: *P. argentipes* (735: Taniguchi 11; 736: Yokoyama 1335: (both photos Nagasawa). 737: *P. subcaerulipes* (Hongo 2028) (photo. Yokoyama). 738: *P. argentipes* (Nagasawa 13) (drawing by Nagasawa). 739: *P. venenata* (Nagasawa 1) (drawing by Nagasawa). 740: *P. subaeruginascens* var. *septentrionalis* (type) (photo. Nagasawa).

Plate 63: Figs. 741-746. - Several species of *Psilocybe*. 741-743: *P. moellerii* (photos. Jacobs). 744: *P. subcubensis* (Johnson 1973052250) (photo. Johnson). 745: *P. cubensis* (Singer 1512) (photo. Singer). 746: *P. coprophila* (Jacobs 44) (photo. Jacobs).

Plate 64: Figs. 747-750: *Psilocybe zapotecorum* (all by Leslie).

Plate 65: Figs. 751-754: *Psilocybe zapotecorum* (751 & 754: anonymous; 752 by Leslie; 753 type of *P. candidipes*, photo. Singer).

Plate 66: Figs. 755-758. - *Psilocybe baecystis* and *P. brasiliensis*. 755-756 & 758: *P. baecystis* (755: Guzmán 16627, 756 by Bigwood; 758 by Leslie). 757: *P. brasiliensis* (Guzmán 8922) (photo. Hodges).

Plate 67: Figs. 759-765: Several species of *Psilocybe*. 759: *P. fimetaria* (photo. Leslie). 760: *P. tampanensis* (type). 761: *P. serbica* (photo. Singer). 762: *P. semilanceata* (Guzmán 16608). 763: *P. mexicana* (photo. Jacobs). 764-765: *P. pelliculosa* (764 photo. Bigwood; 765 Guzmán 16900, photo. Vergeer).

Plate 68 *Electron microscopic studies* (VII): Figs. 766-767. - 766: *Psilocybe cyanofibrillosa*, cheilocystidia and spores (Stamets 78-20). 767: *P. pelliculosa*, hymenium, subhymenium and gill trama (Stamets 78-29) (both photos. by Stamets).

Plate 69: Fig. 768. - *Psilocybe coprophila* on dung growing in the laboratory (Photo. Leslie).

Plate 70: Figs. 769-770. - 769: *Psilocybe zapotecorum* in culture. 770: *P. cubensis* in culture (both photos. by Leslie).

Plate 71: Figs. 771-772. - 771: *Psilocybe montana*. 772: *P. cyanescens* (both photos. by Leslie).

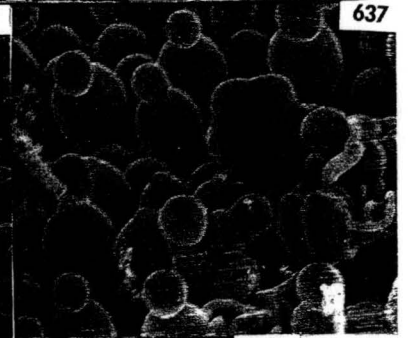
Plate 72: Figs. 773-774. - 773: *Psilocybe phyllogena* (Leslie 4680). 774: *P. montana* (both photos. by Leslie).

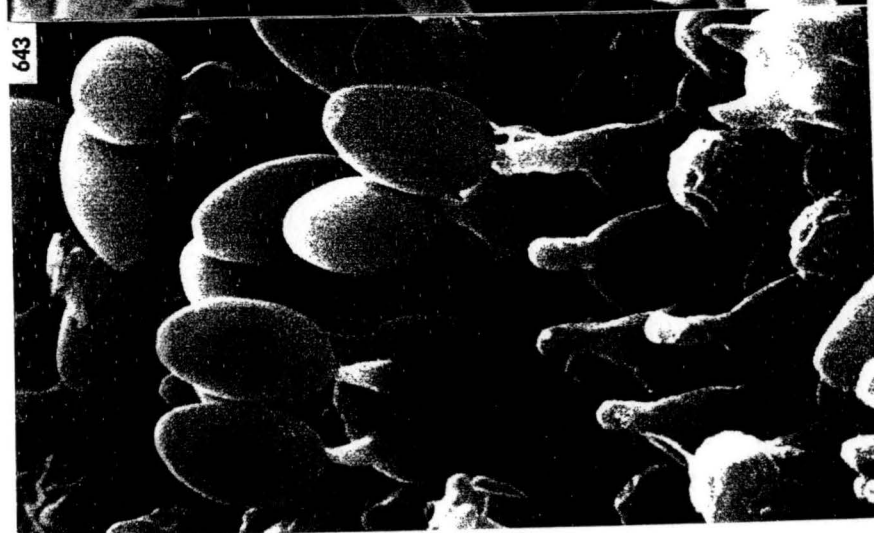
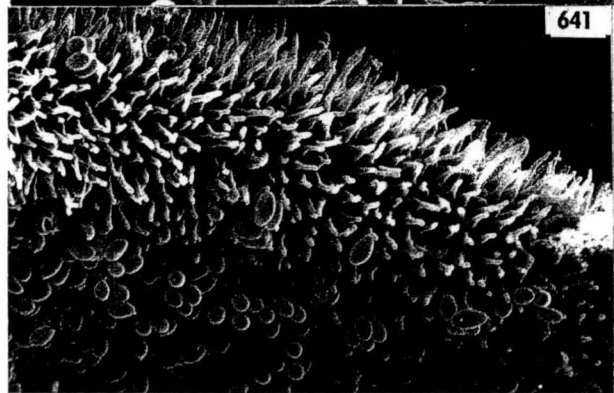
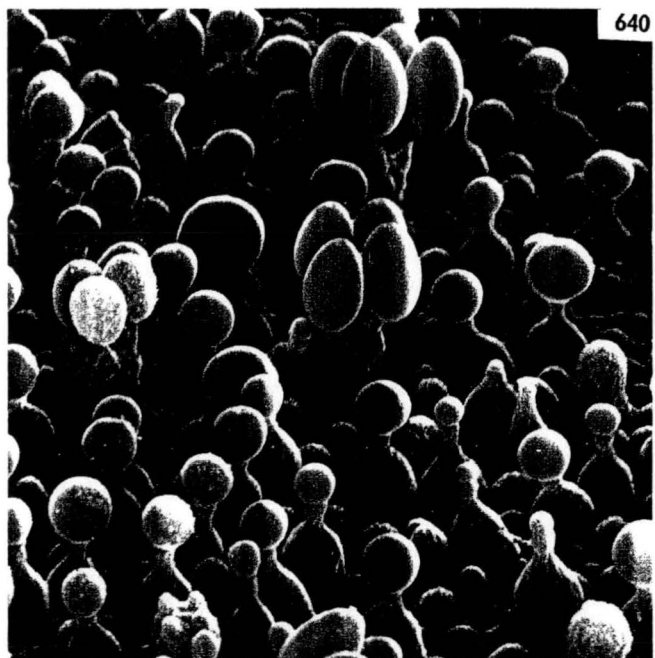
Plate 73: Fig. 775. *Psilocybe zapotecorum*, young carpophores (Leslie 1527) (photo. Leslie).

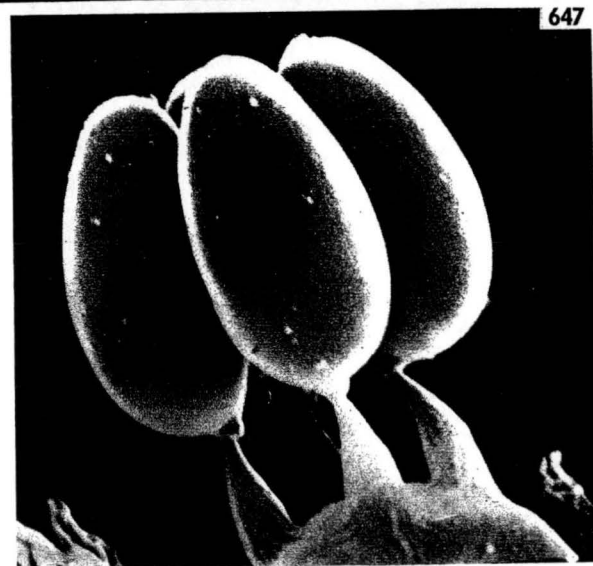
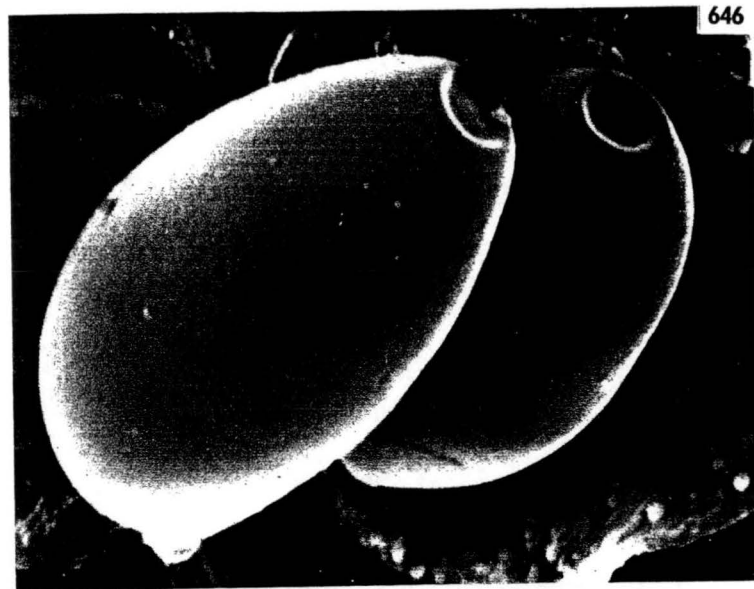
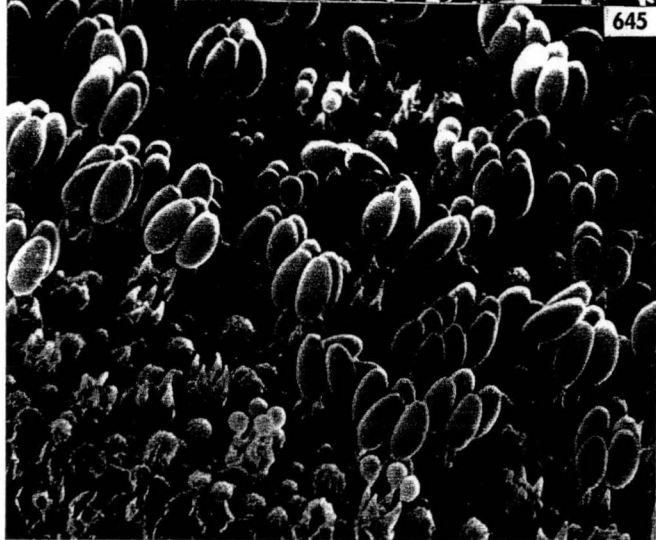
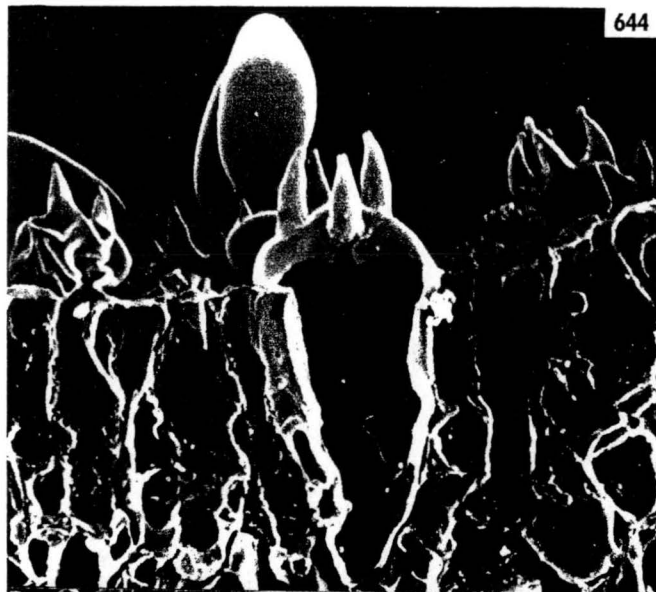
Plate 74: Fig. 776. - *Psilocybe baecystis* (from Canada) (Photo. Leslie).

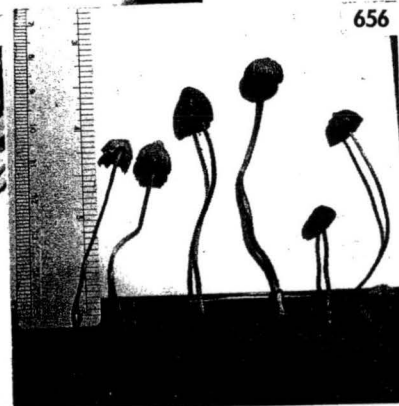
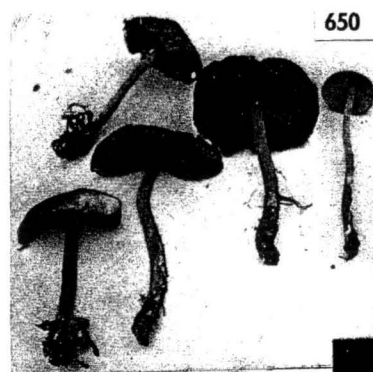
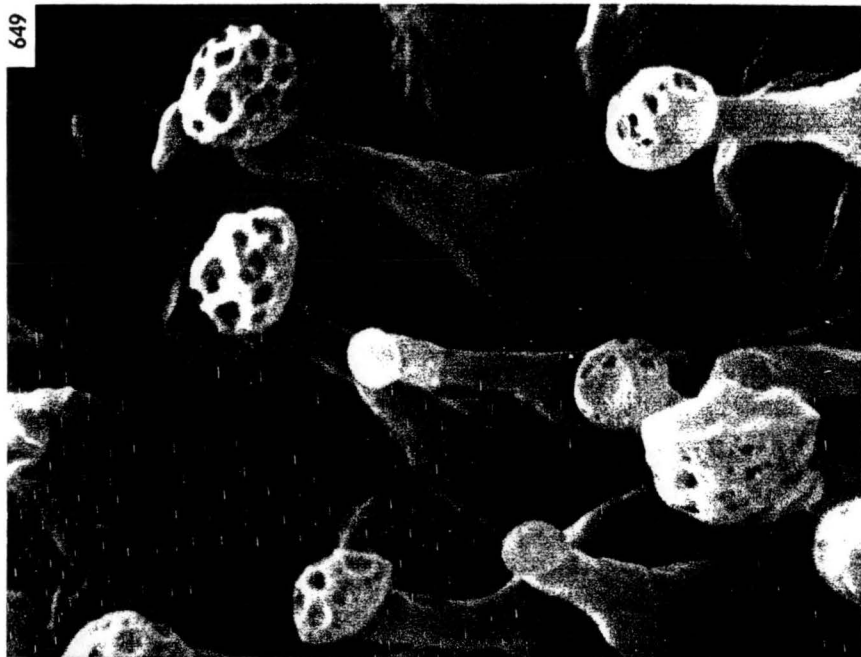
Plate 75: Figs. 777-778: - *Psilocybe cyanescens* (both photos. by Leslie).

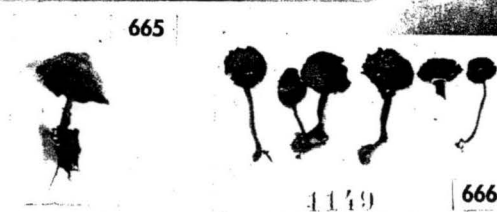
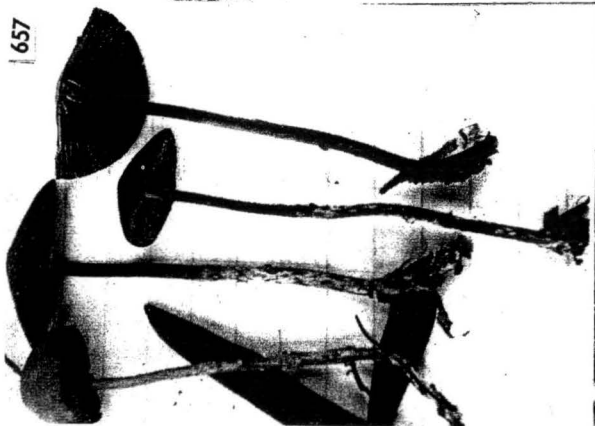
Plate 76: Figs. 779-781: - Several species of *Psilocybe*. 779-780: *P. moellerii*. 781: *P. subfimetaria* (both photos. Leslie).







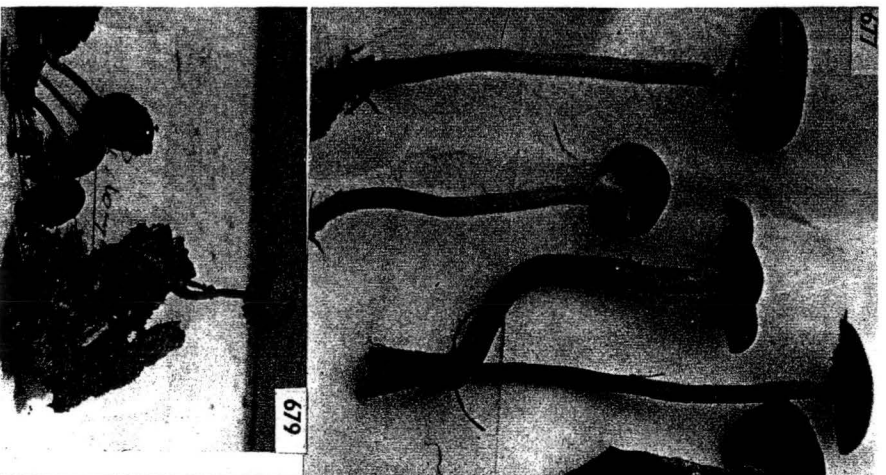
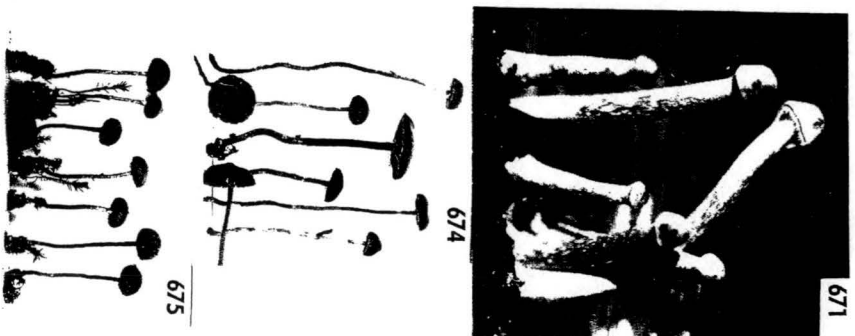
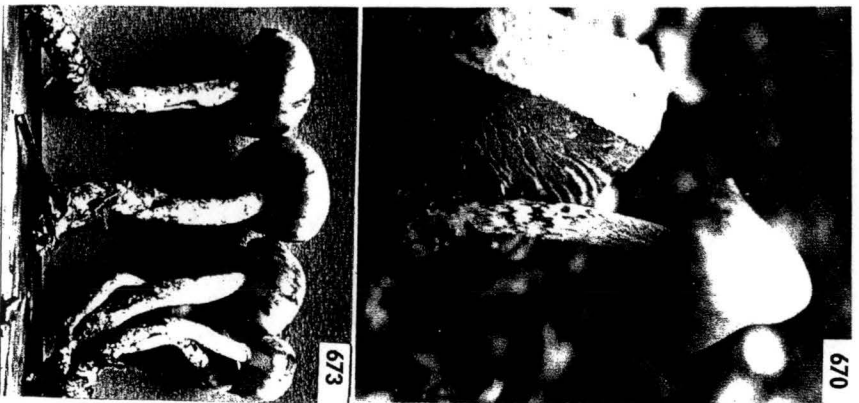


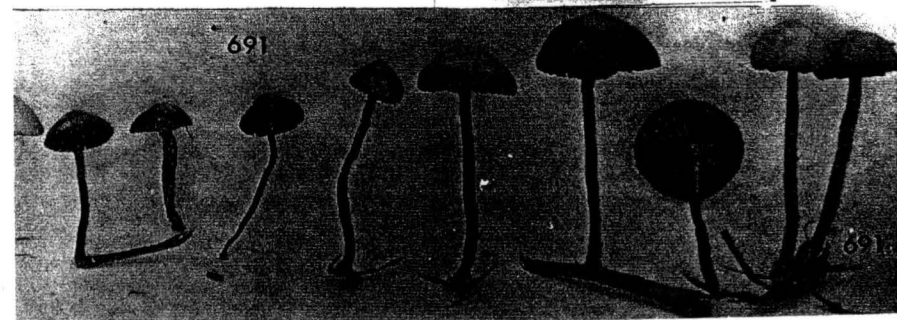


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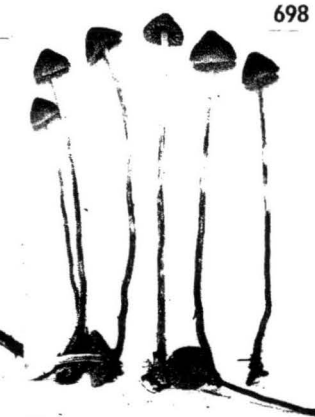
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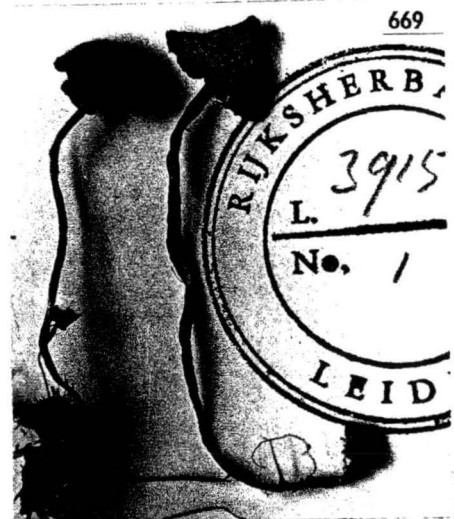
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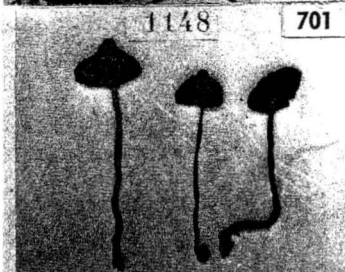
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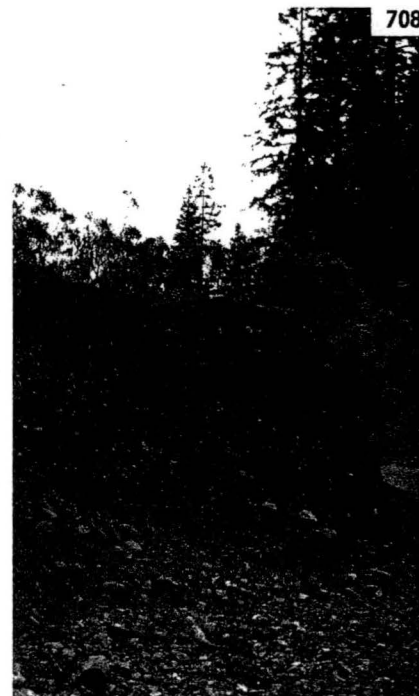
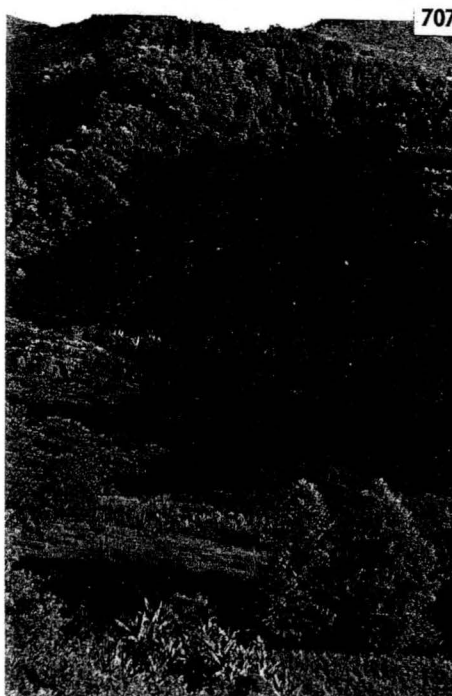
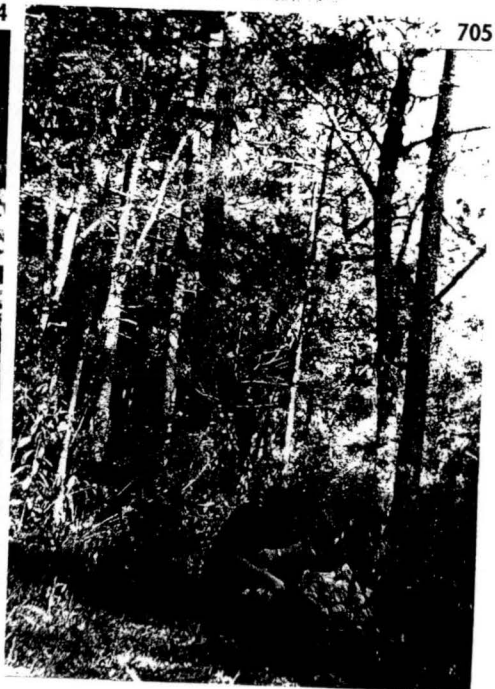


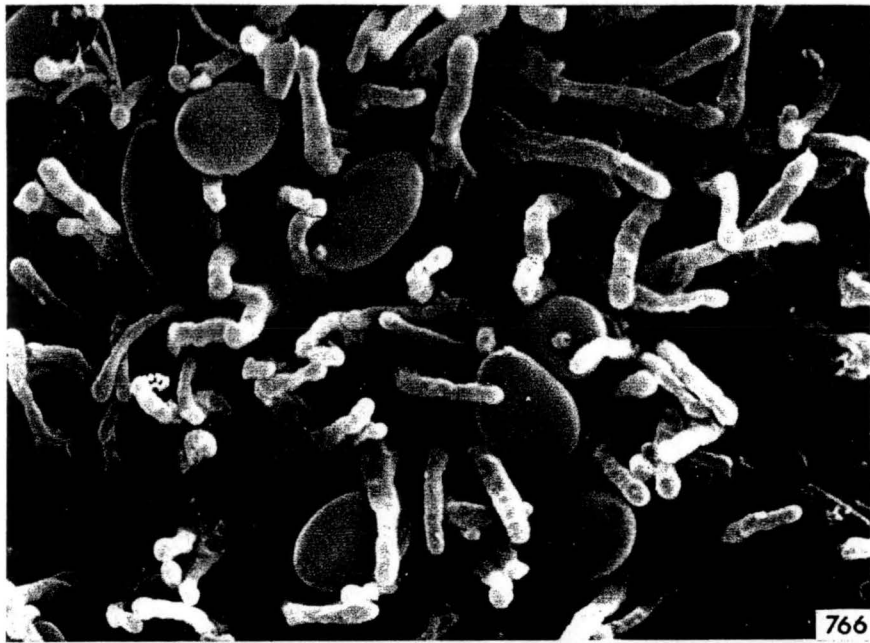
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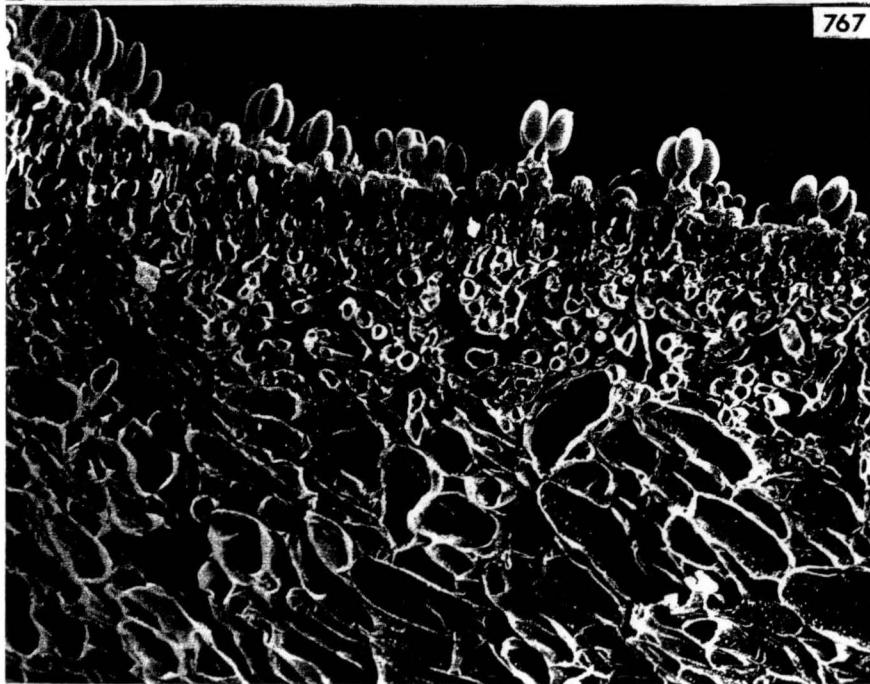
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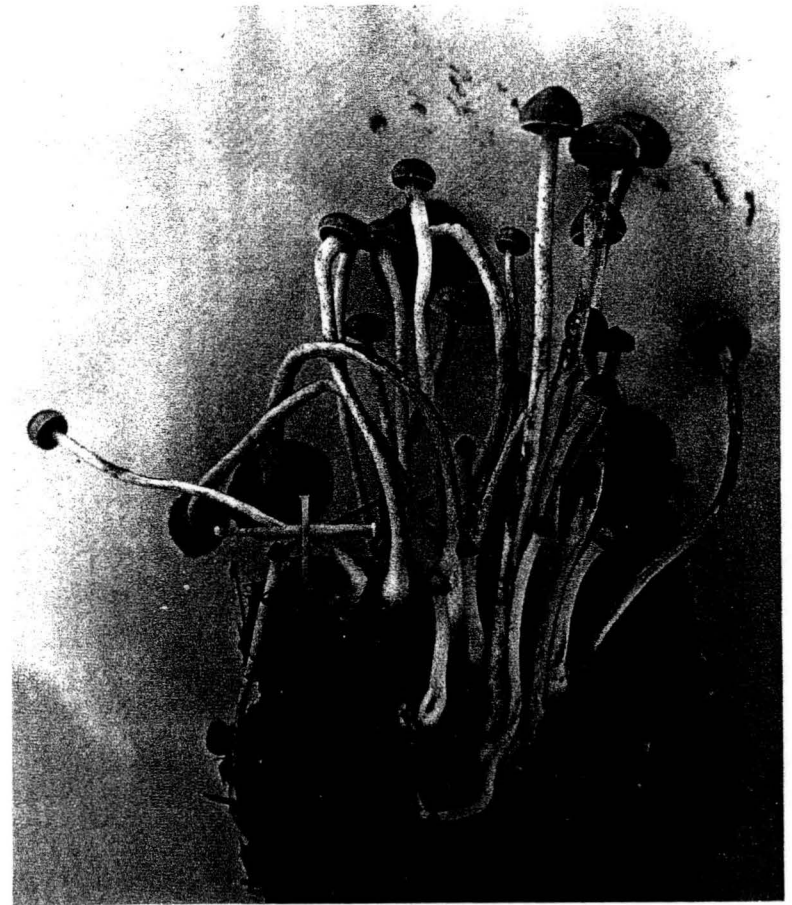




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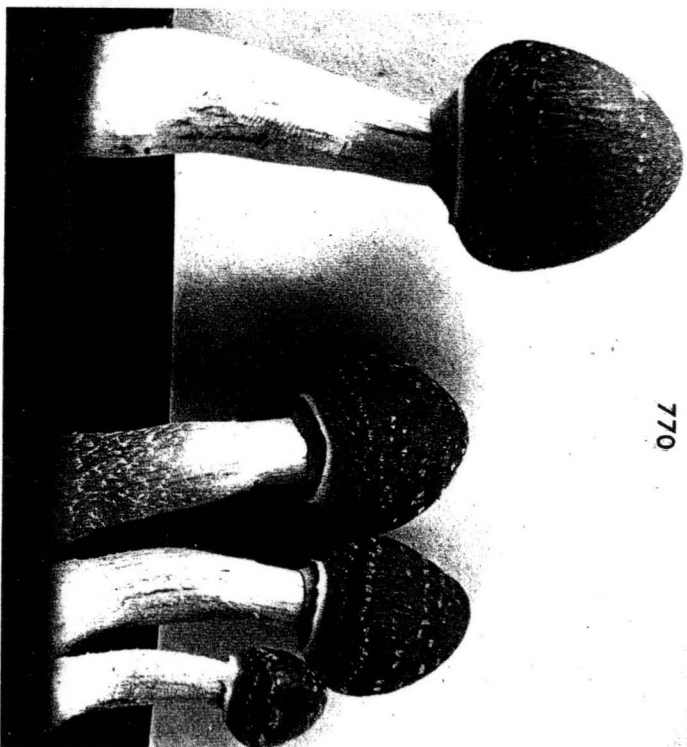


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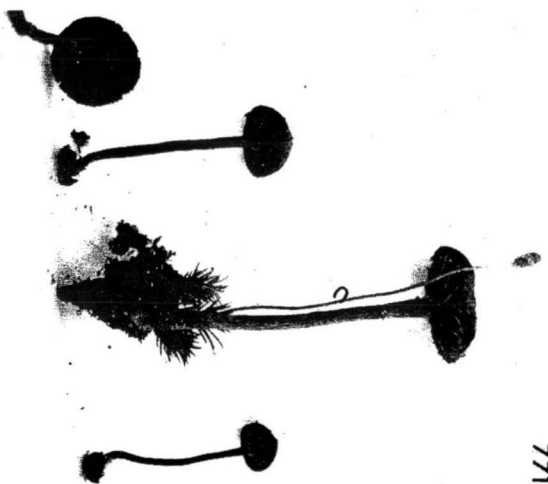




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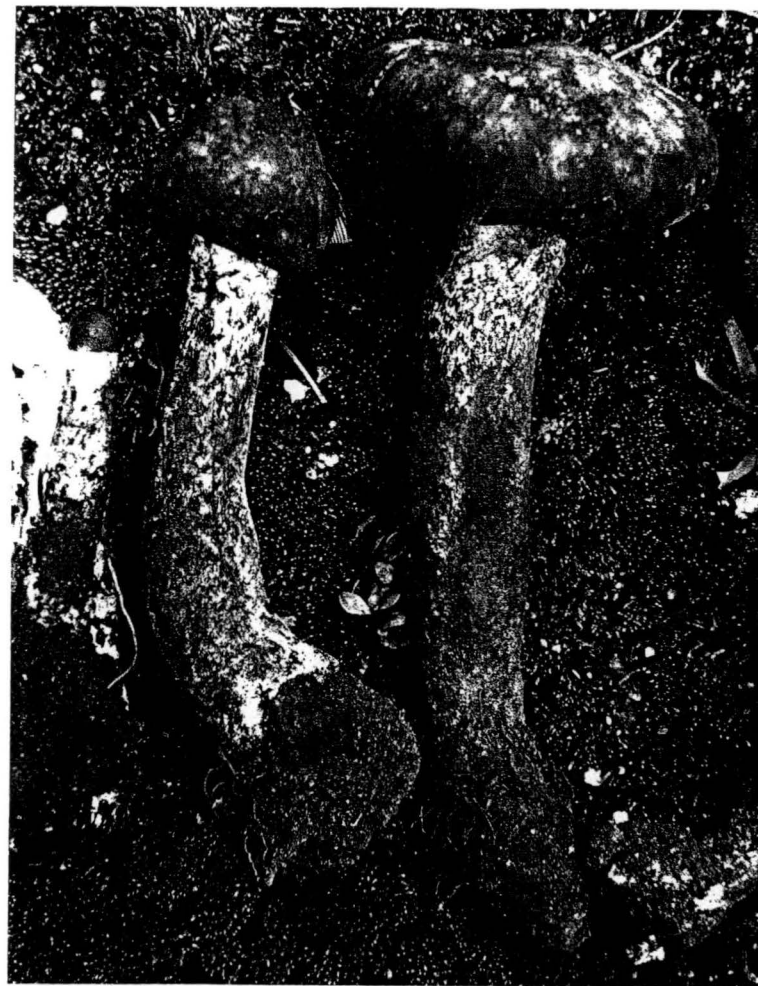
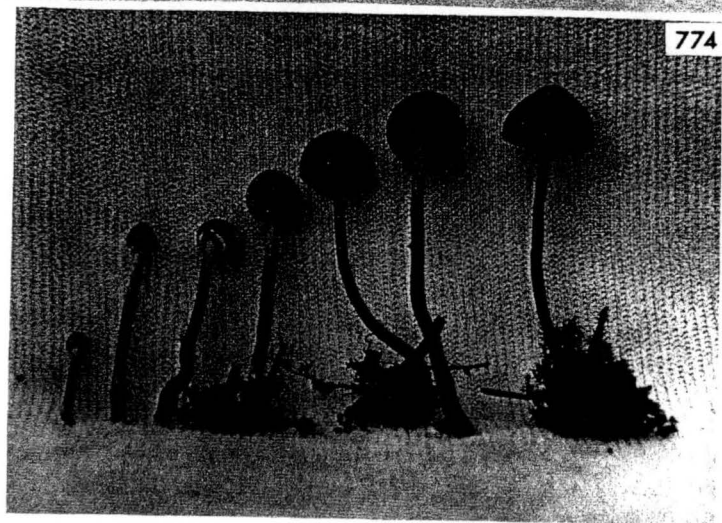
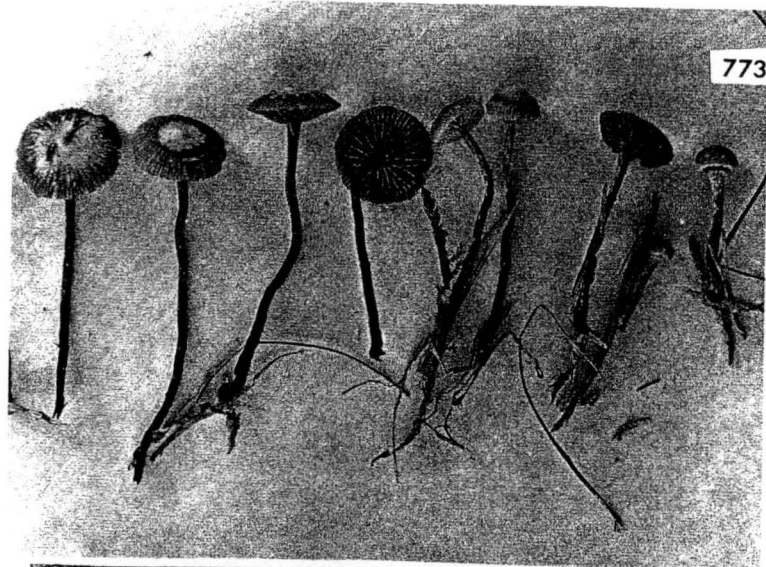
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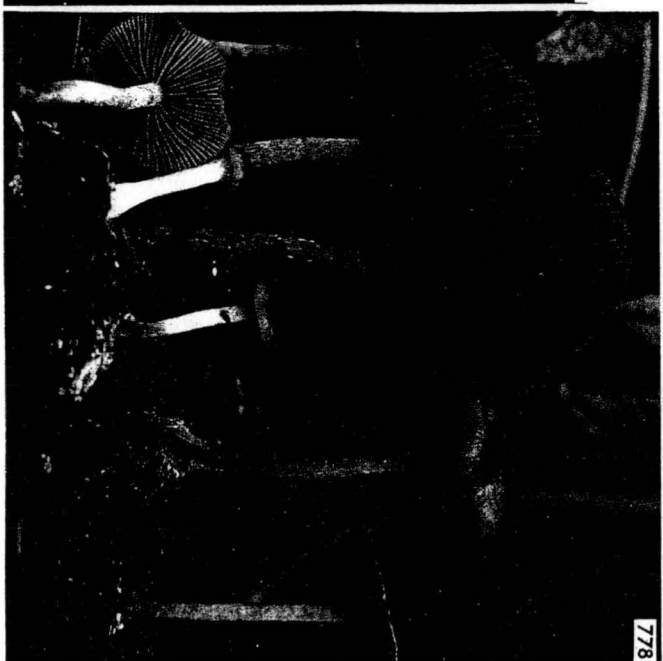
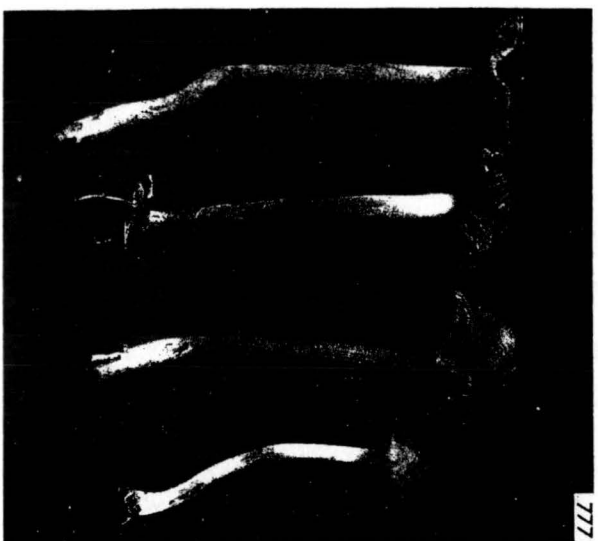
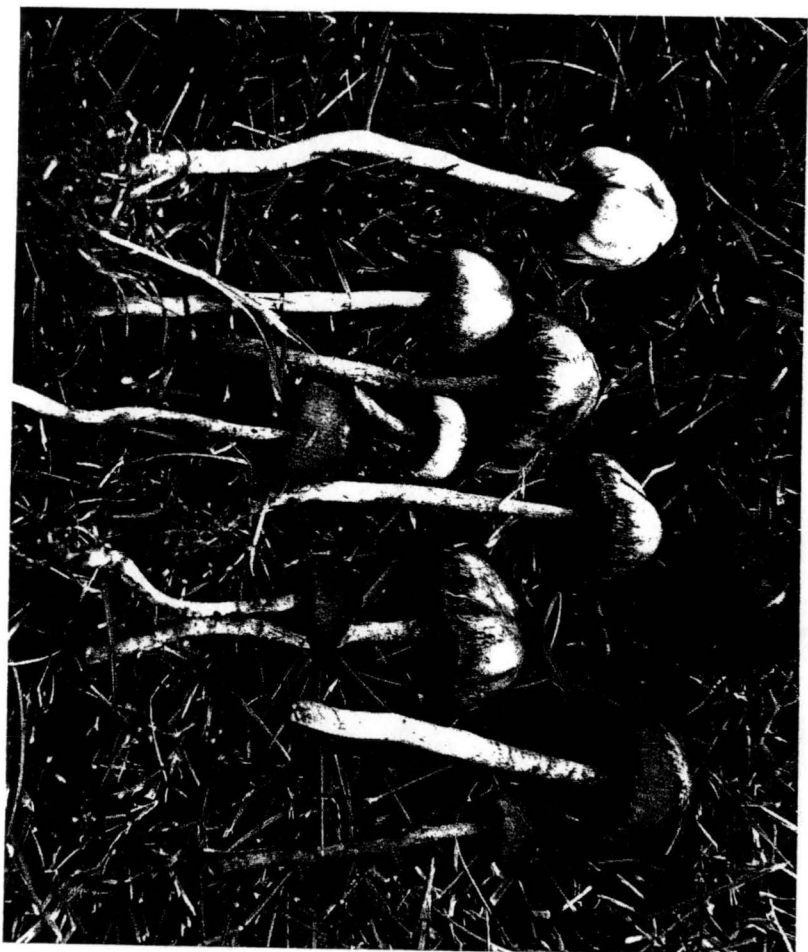


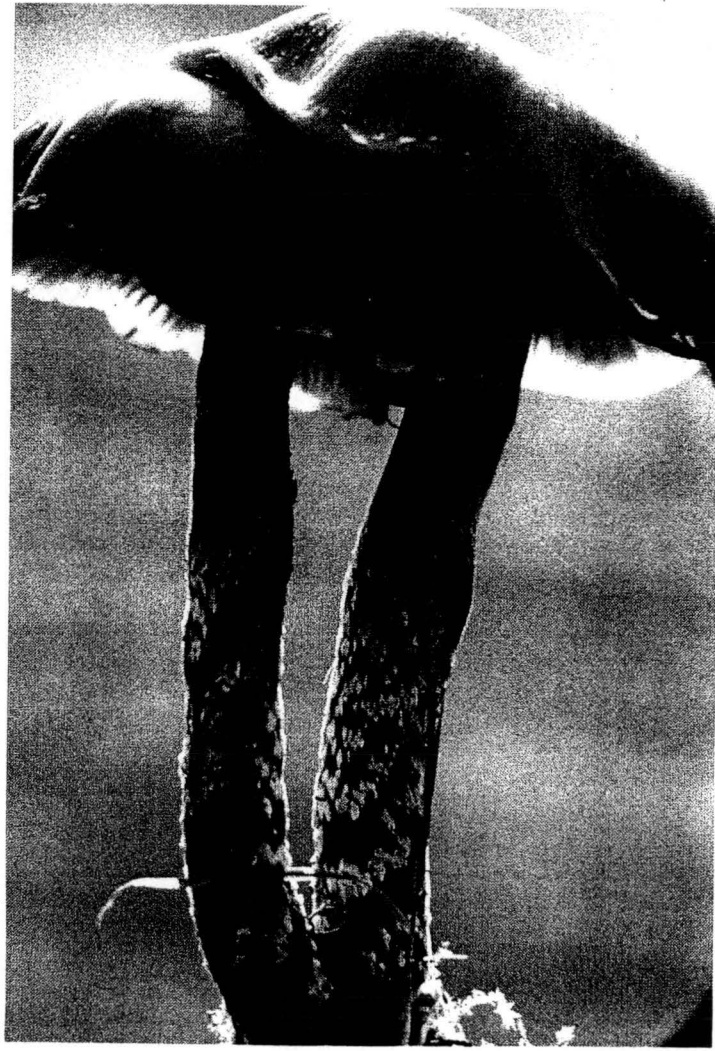
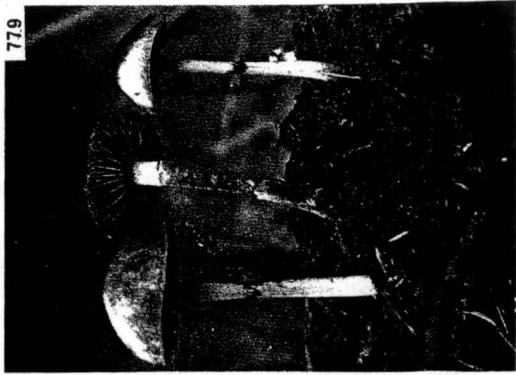
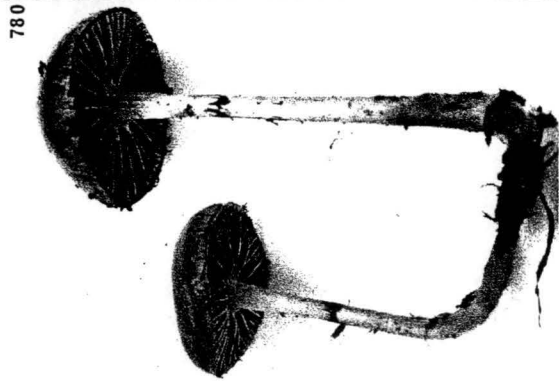
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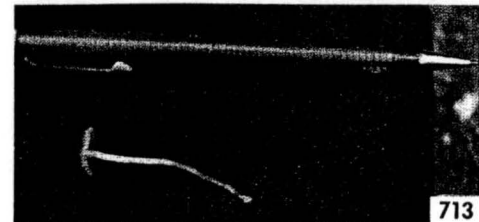
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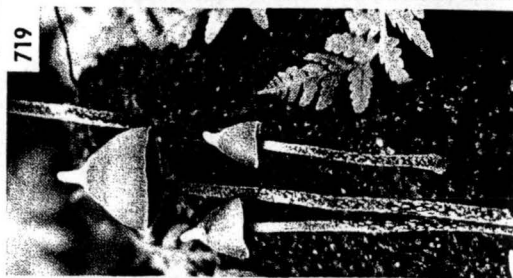
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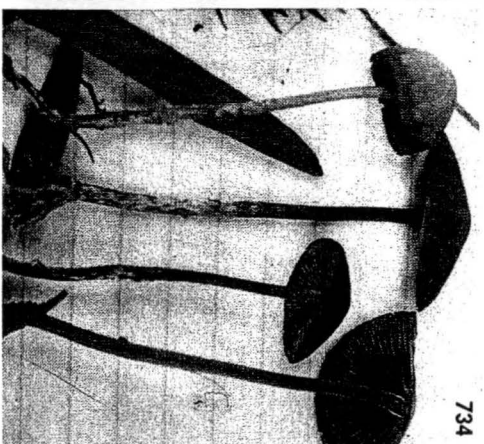
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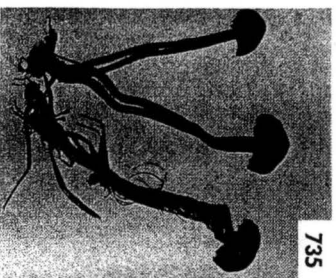
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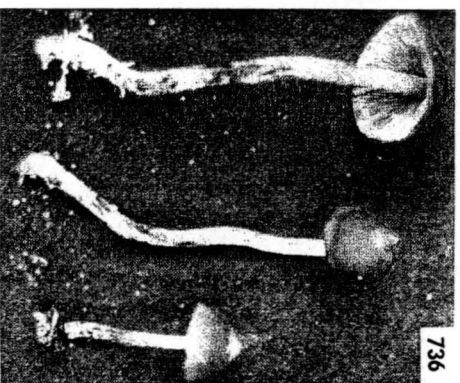
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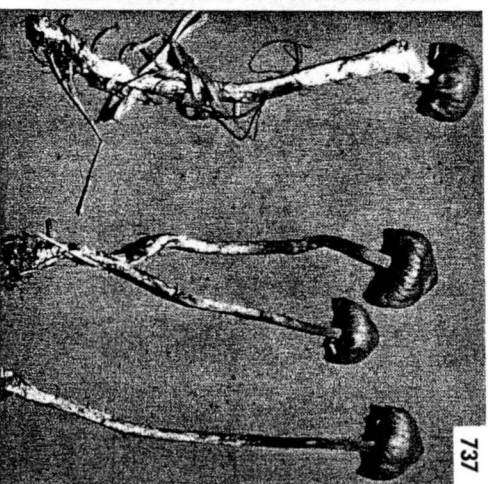
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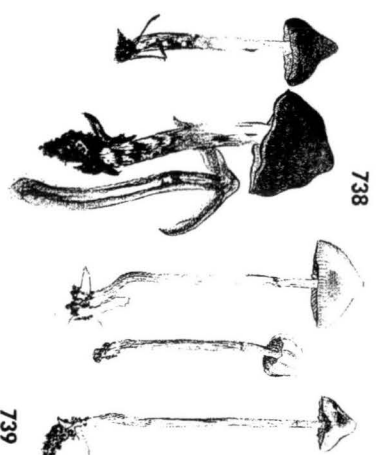
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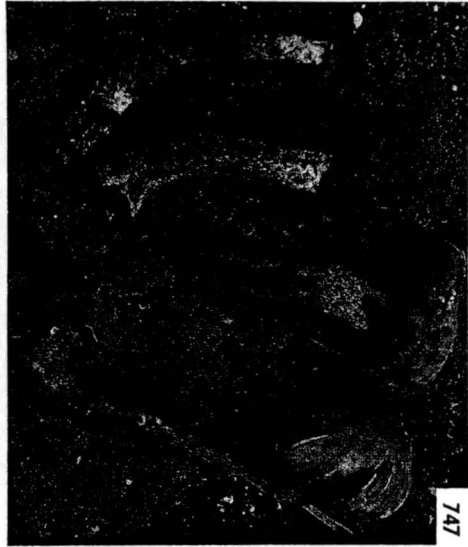
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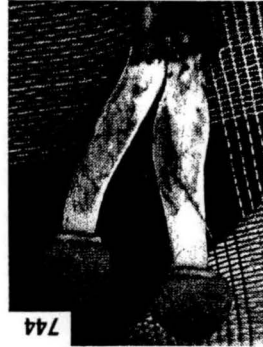
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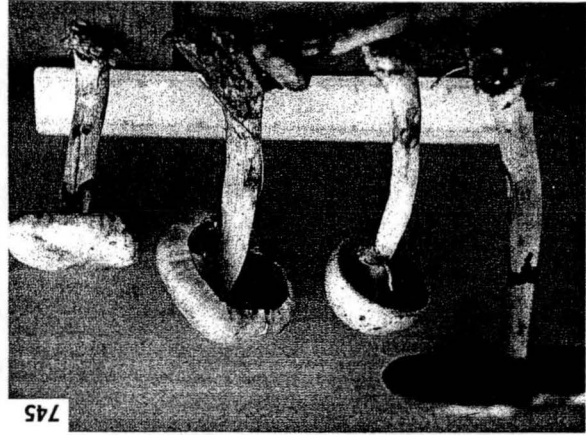
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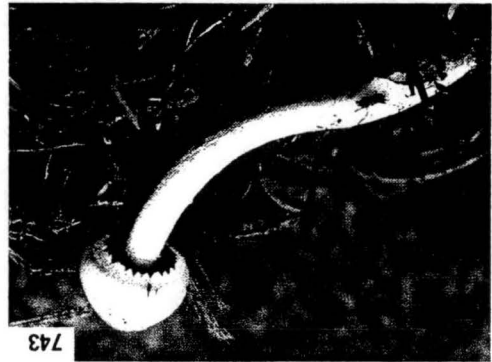
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